Metals Review

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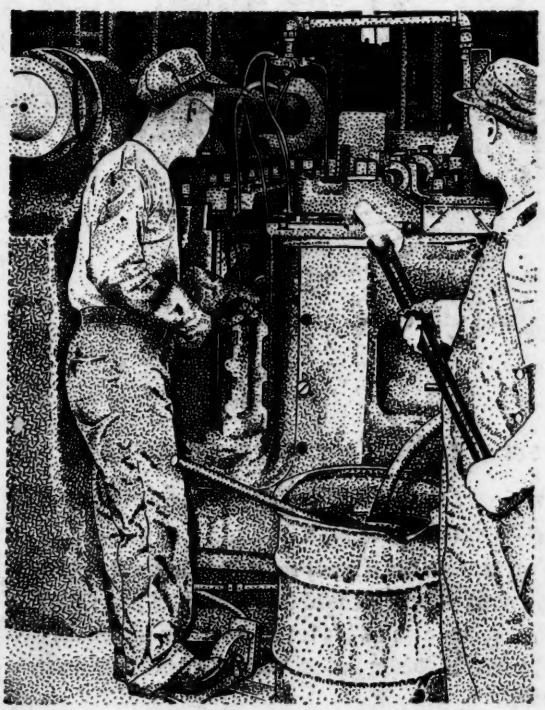
METALWORKING ISSUE



NOTABLE LECTURES

Reported This Month

Speaking on cold reduced sheets, C. L. Altenburger stresses that formability is not synonymous with ductility as ordinarily measured by the common laboratory tests . . . George Roberts outlines new analyses and treatments for broader uses of tool and die steels . . . E. E. Folsom gives duties of quality control engineer, illustrated by data on washing machine and refrigerator manufacture . . . Carl Zapffe divulges new data on stainless steel fundamentals to be included in forthcoming "techbook" . . . H. E. Replogle points out that success in hot work and plastic die steels is often reflected in the selection. use and heat treatment of the steel . . . K. E. Rose warns against effect of impurities introduced with copper, which is becoming an important alloy addition in cast iron.

Featuring

Rolling and Forming of Metal

By H. Maurice Banta
Supervising Metallurgist
Battelle Memorial Institute

Some important developments during the past year as described in the technical literature (with reference to source numbers in the Review of Current Metal Literature).

Equipment & Processes for Rolling, Forging and Presswork

Improved mill products, rolling mill equipment, forge shop equipment, metal forming methods, new presses—large and small, hydraulic and mechanical—as described by the manufacturers.

READ CHECK • PASS ON

- ☐ Management
- ☐ Production
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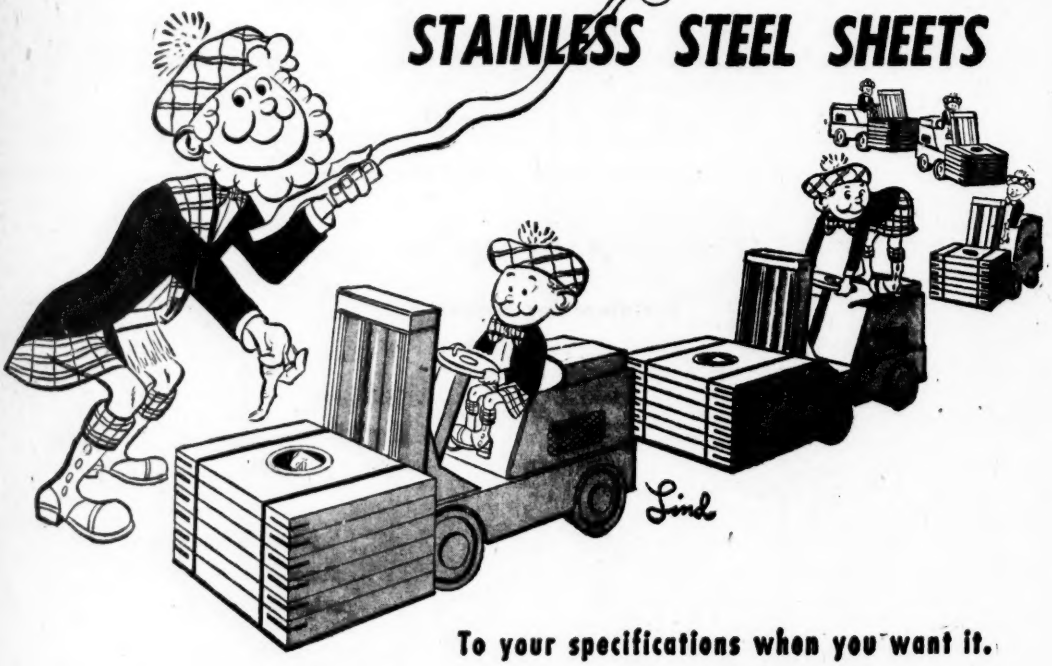
NEXT MONTH—INSTRUMENTS AND THEIR APPLICATIONS

We're Delivering *Lighter* Gauge STAINLESS STEEL SHEETS



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WASHINGTON STEEL CORPORATION — MicroRold — STAINLESS SHEET & STRIP

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November 1947

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Table of Contents

Metalworking Section

Lectures Reported

News of the Industry

Departments

Review of Current Metal Literature

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Rolling and Forming of Metal

Developments During the Past Year as Described in the Literature

By H. Maurice Banta

Supervising Metallurgist, Battelle Memorial Institute

THE PROGRESS that has been reported during the past year on the rolling, forging, and forming of metals has been largely concerned with equipment and methods of increasing production. This is especially so in the steel industry. In the nonferrous field (especially the light metals) the emphasis has been on methods of fabrication and new products. This situation is to be expected and reflects the effort to develop an adequate market for our war-expanded, light-alloy industry, and the desire of the steel industry to make up for the four years lost to civilian production. It is significant that the most important developments in the working of ferrous metals pertain to the production of pipe and strip—the items for which there has been the greatest unsatisfied demand.

New Seamless Pipe Mill

The seamless pipe industry has developed an improved rolling procedure for the production of small-diameter, hot rolled, seamless pipe and tubing at greatly improved rates of production (19-180, July 1947; and 19-76, April 1947*). In the conventional seamless tube mill, the pierced billet is given two or more passes through a two-high rolling mill with a stationary mandrel. The purpose of this high mill is to elongate and reduce the wall thickness of the pierced billet. Following the high mill is the reeler which burnishes the tube to produce the desired surface quality.

In the new mill now under construction, the high mill and reeler are replaced by a continuous nine-stand tandem mill, the rolls of consecutive stands having their axes at 90° to each other, each stand being driven by a 200-hp. motor. A cylindrical mandrel is used extending throughout the entire length of the pierced billet. This mandrel is not stationary but passes through the mill with each piece rolled. Most of the reduction is accomplished in the first six stands, the seventh and eighth stands doing little more than planishing the surface of the tube. Up to this point the tube is oval in shape; the ninth stand rolls it to a circular section. The purpose of this last operation is twofold: First, it produces the desired section, and second, the inner surface of the tube is freed from the mandrel, which is then removed. The advantages of this continuous mill over the conventional procedure are greater speeds coupled with the ability to double the over-all wall reduction. The mill is designed to deliver 65-ft. lengths at speeds up to 900 ft. per min.

*Literature references are designated by the corresponding item number in the Review of Current Metal Literature rather than by repeating the entire title, author and source; the reader can get this information by referring to *Metals Review* for the month indicated.

H. Maurice Banta is a supervisory engineer in process metallurgy research at Battelle Institute. He has had varied experience in metals processing, having worked as a research assistant for the Central Alloy Steel Co. and as a control metallurgist, metallographer, supervising metallurgist, inspector, and research metallurgist for the Jones and Laughlin Steel Corp. He joined the staff of Battelle Institute in 1941 after 11 years of industrial experience. Mr. Banta is a graduate of Purdue University, from which he holds a Bachelor of Science degree in chemical engineering.

Probably the most unusual feature of this mill is the manner of further reducing the tube diameter and wall gage. For this purpose, the conventional sinking mill is replaced by a stretch-reducing mill. In the stretch mill, the diameter of the hot tube can be decreased while simultaneously reducing the wall thickness without the use of a mandrel. This combined reduction is accomplished by tension between the roll stands, created by the increased speed differential between the rolls in successive stands. Substantial reductions in wall thickness of the pipe and especially large-diameter reduction are obtained with relatively few roll passes.

The principal obstacles that have hindered the production of small-diameter seamless pipe are the increase in wall thickness that accompanies the reduction in diameter in the sinking mill (in place of the normally desired decrease in wall gage), and the detrimental effect upon tube quality of heavy reduction. These difficulties are eliminated by the stretch process.

Another limitation of the conventional seamless process for small sizes of pipe is the desirability of using billets of largest possible diameter and minimum length. This is necessary to facilitate the piercing and subsequent rolling operations necessary to elongate the pierced billet and reduce the wall thickness (done over a mandrel), and also to facilitate the reeling operation for improving the surface. It is obvious, therefore, that the seamless high and reeling mills do not constitute the most desirable source of material for the conventional sinking mill, in which the extent of reduction is limited because of the accompanying increase in wall thickness and the adverse effect upon the quality of the pipe.

The application of the stretch-reduction mill is limited, however, to large, high-production mills, since the tension is not created until the front end of the tube has entered the second stand. The entering portion of the tube, therefore, has a heavy wall, and a similar condition occurs at the back end. The heavy end losses are kept to a minimum by rolling relatively long lengths and by the unique design of the mill which keeps the distance between stands to a minimum.

Cold Strip Mills

The tandem mill for the cold reduction of strip, which utilizes tension between the consecutive stands and between the reels and stands, is a relatively recent development. The trend in tandem mill design, since the early

mstallations, has been toward wider mills and higher rolling speeds. During the past year, the world's largest and fastest cold reduction mill was placed in operation—a 42-in., 5-stand, 4-high tandem mill capable of speeds up to 5000 ft. per min. (19-173, July 1947). This is approximately three times the finishing speed of most of the mills now in operation and approximately one third faster than the previous record. The production of this new mill will be limited principally to strip for tin-plate which ranges in gage from about 0.006 to 0.15 in. The auxiliary equipment and reels are designed to handle 30,000-lb. coils, which in the lighter gages are strips approximately 5 miles in length. Taking into consideration the high speed at which the mill operates, special precautions were taken to reduce vibration to a minimum; the foundation, for instance, is 50% heavier than used in any of the previous mills.

Developments in the field of electrical engineering, both in the drive and the electrical control system, are the principal contributing factors toward increased speeds and tonnages, as well as toward the improved quality now obtainable from the modern cold mill. The most outstanding feature of this new mill is the method by which it is driven. The first three stands are powered by double-armature motors so as to minimize the armature inertia. The fourth and fifth stands are unique in that each work roll is driven by its own individual motor through a speed-up gear, eliminating any mechanical connection between the top and bottom rolls—an innovation in the history of high-speed cold reduction mills.

After the speed of each stand in the mill is selected, the electrical control system is so arranged that a constant speed relationship is maintained between all of the stands, starting with the threading operation and continuing through the running and stopping stages. Results of production experiments have shown that, starting with a threading speed of 500 ft. per min., the mill can be accelerated to 4000 ft. per min. in approximately 9 sec. In an emergency, the mill can be stopped in about 4 sec. from a speed of 5000 ft. per min.

The high-speed tandem mills are suitable only for the production of large tonnages of a specific product and, therefore, serve an entirely different purpose from the 4-high reversing cold strip mill (19-183, July 1947). The low investment cost of the reversing mill, together with its adaptability, makes it a most satisfactory piece of equipment for rolling numerous low-tonnage specialties, such as stainless steel strip in a wide range of widths and gages, high-silicon transformer sheets, or such nonferrous metals as brass and copper in a variety of widths and gages.

Of the new specialty mills placed in production during the past year, one that has attracted considerable attention is a 36-in. wide Sendzimer mill for the cold reduction of stainless strip to extra light gages (19-138, June 1947). While it is expected that the bulk of the production will be in gages between 0.078 and 0.004 in., the mill is said to be especially suitable for rolling to foil gages. A growing demand for the extra light gages is anticipated.

This 36-in. mill is the widest Sendzimer mill ever built, almost doubling the previous 19-in. mill of this design. The construction is essentially a reversing-type cluster mill, using 1½-in. diameter toolsteel work rolls operating in an oil bath. Speeds up to 400 ft. per min. are obtainable. This mill fulfills the need for equipment that will produce extremely light gages to a high degree of accuracy from highly work-hardening metals, such as the stainless steels.

In the nonferrous industry, a similar trend is found toward large, faster, and more accurate mills. To meet the expanding demand for aluminum foil, 2-high and 4-high reversing mills are now in production that are capable of handling coils 30 in. in diameter by 32 in. in width and weighing 1200 lb. (19-277, Dec. 1946). These mills can roll foil down to 0.00025 in. thick at speeds up to 1200 ft. per min.

Use of constant-temperature oil-film bearings eliminates any increase in journal temperature during rolling, thereby removing the main obstacle to rolling at high speeds and maintaining the desired gage. In order that the roll temperature and contour may be accurately controlled, these mills are equipped with adjustable oil sprays and wiping units. The tension between the reels and mill may be set while the mill is at a standstill and automatically maintained while accelerating, running, and decelerating.

Cold Extrusion

In the field of cold forming, the most revolutionary news released during the year was a method developed by the Germans for the cold extrusion of steel. Members of the U. S. A. Technical Industrial Intelligence Division, who followed the Army across the Rhine, learned that as early as 1935 German engineers had extruded cold steel through an open die to form cartridge cases (19-119, May 1947). By 1942, cold extrusion was used for numerous parts previously produced by cold drawing, forging, or machining, such as cylinders for airplanes, fuse bases, and many other cup-shaped and cylindrical objects.

The discovery behind the cold extrusion of steel was that a phosphate coating, similar to bonderizing, would prepare the surface of the blank to be extruded so that numerous lubricants would act effectively. Previous attempts had failed because of inadequate die lubrication.

Briefly, the process consists of two steps. The first operation is the production of a heavy-walled cup by pressing a punch into a slug held in a closed die. In the second step (the extruding operation) the cup is placed in an open die. The shoulder of the punch exerts the force which flows the metal through the die while the inner cylinder wall is shaped by the smaller leading portion of the punch. In actual production, both steps may consist of several operations, with annealing treatments as needed.

The steel used by the Germans for this process was a low-carbon, low-silicon steel of good deep drawing quality. Extruding pressures were reported to be in the neighborhood of 170,000 to 230,000 psi. on the annular shoulder of the punch. It is said, however, that American engineers have succeeded in reducing the required pressure to as low as 30,000 psi.

The phosphate coating is believed to perform two functions: First, it may act as a lubricant itself; second (and probably most important), the coating holds the added lubricants so that an oil film is maintained between the steel and die. The surface was prepared for the phosphate coating by degreasing, and, if necessary, the surface scale removed by pickling or sandblasting. The thickness of the phosphate coating required depends upon the particular job and can only be determined by trial. For lubricants, the Germans found that both vegetable oils, such as rapeseed or palm oil, and tallow or fatty soaps, were suitable.

Any type of press that develops sufficient pressure and stroke speed, and responds to control, was found suitable. While stroke speeds of 4 to 8 in. per sec. were generally used, speeds have been as high as 12 in. per sec.

One advantage of the process is high accuracy, one American manufacturer having produced parts accurate to 0.001 in. A major limitation of this method of cold forming is that the cross section of the cylinder produced is uniform, and the walls cannot be tapered or bulged. The question of economics is still to be determined in this country. In wartime Germany, cold extrusion was especially attractive because of the saving in material.

Hot Extrusion

While methods of extruding nonferrous metals such as aluminum, magnesium, copper, and their alloys have been in practice for a great number of years, it is only recently that means were developed for extruding nickel alloys and stainless steel. The necessity for temperatures up to 2400° F. for the extrusion of these latter metals has discouraged the use of this means of fabrication (19-190, Aug. 1947).

As the result of a demand for cupronickel (30% nickel, 70% copper) condenser tubes back in 1926, the English developed a method for producing first-class tubes even though extrusion temperatures as high as 1900° F. were required. At that time, considerable difficulty was experienced with the dies, mandrels, and container liners which came in contact with the high temperature of the billet. Since then, however, marked improvements have been made in the high-temperature alloys available for such applications.

Subsequent work in this country on a 660-ton vertical press demonstrated the possibilities of the process, and a number of large presses were placed in operation in England, France, and Czechoslovakia long before the start of World War II. These were horizontal double-acting presses which can extrude a solid billet into a tube in one operation by using a loose piercing head on the mandrel, which produces a hole slightly larger in diameter than the mandrel; the loose head falls from the mandrel together with the punching at the end of the piercing stroke. This arrangement allows the mandrel to enter the pierced billet without scraping off the lubricant. (Importance of this lubricant had been revealed in earlier American work.) At the high temperatures and pressures employed, there is a strong tendency for the metal to weld to the tools. This is overcome by application of a heavy grease to the tool surfaces contacting the hot metal. The grease burns and leaves a carbon coating which acts as a lubricant between metal and tool.

It was not until 1943 that a large horizontal press (4000 tons, double acting) was placed in operation in this country. While this installation was made for extruding monel, Inconel, and nickel, numerous trials have been made on stainless and other special steels, known to be difficult to process into tubing by other methods.

Developments resulting from the new American press have made it economically possible, for the first time, to produce large size tubes from solid billets. In the old conventional process (billets pierced in an open die with a relatively large mandrel) the scrap from the piercing operation might be as much as 50% of the billet. With the cupping method, scrap loss is reduced to approximately 4%. In this procedure, the die is closed and the piercing operation forms a deep cup, the displaced metal backfilling the container. A thin section of metal (the bottom of the cup) is left between the head of the mandrel and the plate used for closing the die; this thin section is pushed through the die by the mandrel after the closing plate is removed.

This method has been used to produce large quantities of tubes up to 9 in. in outside diameter from gilding metal, and tubes up to 8 in. diameter from monel metal. The method is expected to prove satisfactory for the production of large stainless steel tubes, since both stainless and monel have about the same temperature range for extruding. Present experience indicates that the heating of the billet prior to piercing is of considerable importance. To obtain good concentricity, the billets must be heated uniformly and to the proper temperature for the particular grade of metal being worked in order to reduce the extrusion resistance to a minimum. The billets must also be free of scale to prevent excessive die wear and to obtain a satisfactory tube surface. The billets may be descaled, but it is preferable to heat under conditions that prevent the formation of scale. Use of a salt bath appears most promising, but has not been tested on a production scale.

Hot extrusion must be conducted rapidly to prevent cooling of the billet surface which is in contact with the container walls. With a high-speed press, there is virtually no loss in temperature during the extruding operation, the rapid deformation producing considerable heat. With ram speeds of 4 to 6 in. per sec., extrusion speeds of 80 to 150 in. per sec. are possible.

For the rapid extrusion of tubes with wall gages ranging from ¼ to ½ in., the pressure required on the billet is between 100,000 and 120,000 psi. for an extrusion ratio of 1:20 to 1:25 (the relation between the area of the extruded product and the cross-sectional area of the billet). For 18-8 stainless steel or monel metal, the maximum ratio for economical production is 1:25. Experience has shown that the length of the billet should not be more than twice the diameter because resistance to extrusion increases rapidly with length. The length of extruded tubes is limited to approximately 20 ft. because the lubricant on the die is removed progressively as the metal passes over it, ultimately leaving the die without protection. At the present time, there is no known method of overcoming this lubrication problem. A billet of a given diameter is ideal for only one tube size if extrusion resistance and tool wear are to be kept to a minimum and good concentricity obtained. For practical purposes, however, a ratio of 3 to 1 between billet diameter and inside diameter of the tube has been found satisfactory for metals that must be extruded at a high temperature.

Since the extrusion of high-temperature metals in this country has been limited to one plant, the development of suitable materials for tools has progressed rather slowly. For the die which must withstand high pressures and temperatures together with the wearing action of the metal flowing over the surface, chromium-tungsten hot work steels containing 9 to 15% tungsten have been used; also cast heat treated dies made from a chromium-molybdenum-tungsten analysis. A chromium-tungsten steel (about 9% tungsten) has been used for container liners, mandrels, and dummy blocks.

After each extrusion cycle, the mandrel must be cooled either in air or oil. For large mandrels, a continuous internal water-cooling procedure appears most promising. Under present operating conditions, the dies and container liners do not need cooling, but if production rates are increased, it may be essential.

The possibilities offered by hot extrusion appear to be most promising, since it provides a means of fabricating those metals and alloys which cannot be worked by the more conventional methods. Since the entire operation requires only a few seconds, extrusion is especially suitable for metals that can only be hot worked in a very narrow temperature range. Hot extrusion also provides a means of fabrication for alloys which tend to crack in the conventional seamless piercing mill. Extrusion should also be considered where especially high surface quality is required both inside and out.

Zinc Alloy Dies

In the early days of the all-metal airplane, aircraft manufacturers resorted to various expedients for forming aluminum alloy panels. With the low volume of production and frequent design changes, it was obvious that the cost of dies and auxiliary equipment had to be kept to a minimum. This situation resulted in the development of lead punches and pure zinc dies for use in drop hammers. With production greatly increased by the war, the aircraft producers were still reluctant to adopt the conventional methods used by the automobile industry for forming sheets because the volume did not justify costly iron and steel dies. This situation led to an investigation of "soft die" materials and techniques, and eventually to the development of a zinc-base alloy known as Kirksite (19-155, July 1947).

This alloy consists of 3.5 to 5.0% aluminum, 4.0% copper, 1% magnesium, and the balance zinc. Such elements as lead, tin, and cadmium should be kept to a minimum in order to prevent intergranular corrosion and resulting loss of strength and impact resistance. In a period of 12 months, the presence of small amounts of these impurities may cause a loss of 33% in tensile and 75% in impact strength. Iron is also an undesirable impurity because of its adverse effect upon the smoothness of the cast surface, its tendency to increase shrinkage at the corners of the casting and to promote brittleness. Care must be exercised to prevent iron contamination from the melting pot. Temperature of the pot must not become excessive and the pot must be properly coated.

When cast in sand and cooled under normal conditions, the alloy is said to have a tensile strength of approximately 37,800 psi. and a Brinell hardness of 100. Brinell hardness can be raised to 130 by quenching the casting. The pure zinc previously used for dies has a tensile strength of about 5300 psi. along with a Brinell hardness between 30 and 60.

In addition to a low melting temperature (717° F.), which simplifies melting and casting problems, the alloy has a uniform shrinkage characteristic (0.14 in. per ft.) so that the die may be cast close to size. This eliminates the need of elaborate profiling machines, and the castings are sufficiently soft so that high spots can be removed with simple hand tools.

Simplified procedures have been developed, frequently requiring only one pattern. A plaster cast is made from the first casting and coated with iron oxide, the second casting being made around the coated cast. This procedure gives a good fit between the two

(Turn to page 55)

EQUIPMENT AND PROCESSES

for Rolling, Forging and Presswork

Manufacturers Describe New Methods and Products for High-Speed Metal Fabrication

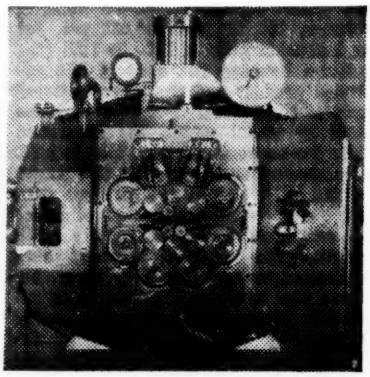
COLD DRAWN products (strip, tubing, wire, nonferrous rods and bars) of better finish and improved properties are the result of some notable advances made during the past year through the combined efforts of the mill operators and the equipment manufacturers. High-speed production is also an important result of these innovations, as exemplified by Weirton Steel Co.'s mile-a-minute cold strip mill described in Mr. Banta's article on page 5. This 42-in., 5-stand, 4-high tandem mill is only one of several built by United Engineering and Foundry Co. (R-934)* for Weirton and other companies.

Motors and electrical control apparatus installed on this rolling mill were designed by Westinghouse Electric Corp. (R-935). The six mill and reel motors total 17,500 hp.; a 4500-hp. unit delivers the finished product from the last stand. Each motor required individual design to coordinate the five sequences of speed necessary for passing the steel through the five sets of rolls.

Also mentioned in Mr. Banta's article is the use of the Sendzimir mill for cold reduction of stainless steel to extra-light gages. This installation went into operation last April at the new plant of Washington Steel Corp. (R-936). Austenitic stainless steel 36 in. wide is reduced from 0.118 to 0.018 in. in 7 passes without any intermediate anneal or pickle—an unprecedented series of passes for this material in this width. The trade name Micro-Rold typifies the accurate finish and uniform gage of the product.

A process of forming and welding fine tubing from coils of bright annealed, cold rolled strip has been developed by Superior Tube Co. to make its Weldrawn tubing available at low cost (R-937). After several cold drawing operations the welded area assumes the same appearance and qualities of the parent metal. No metal filler or flux is used. The tubing is available in stainless steels, beryllium copper, nickel and other alloys in diameters ranging from 0.010 to ⅝ in.

A new type of electroplated and drawn wire that can be bent, swaged, hammered, woven or twisted without flaking is now being produced in commercial quantities by Kenmore Metals Corp. (R-938). To produce Fernicklon (trade name of the product), metal rods ¼ in. in diameter are electroplated continuously and then cold drawn to diameters as fine as 0.0038 in. It can be ordered in continuous sections of almost any length. Initial production is confined to nickel-plated steel and nickel or silver-plated copper wire, although plans are under way for many other combinations.



Sendzimir Mill Installed at Washington Steel Corp. for Cold Reduction of Stainless Steel

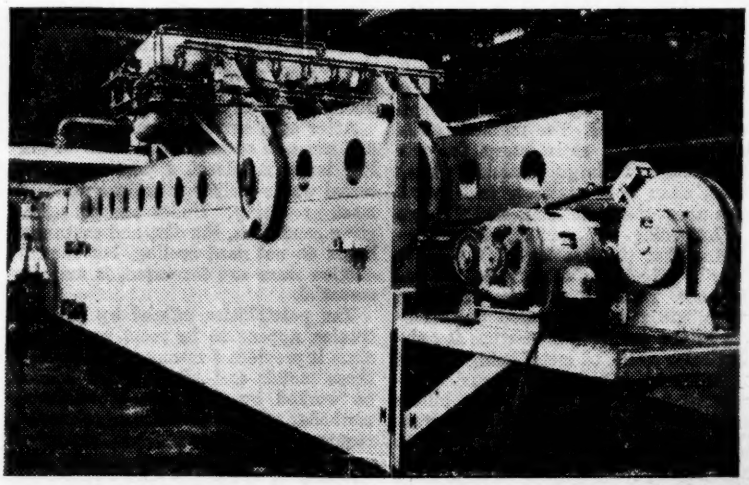
Unusually large diameter brass rods (up to 7½ in.) have been introduced by Titan Metal Mfg. Co. (R-939), as well as extruded squares and hexagons in diameters up to 4¼ in. and rectangles 3x5 in. These large shapes are available in Nittany free-turning brass, naval brass, manganese bronze and free-turning nickel silver.

A new aluminum bronze known as Ampcoloy 49 has been developed by Ampco Metal, Inc. (R-940) for cold heading. With a Brinell hardness of 80 (3000-kg. load) in diameters up to ½ in., it may be easily cold worked into bolts, rivets and similar fastenings. It is made as extruded rod up to 3 in. diameter, in coils up to 0.420 in., and in shapes and rectangles.

Miscellaneous Mill Equipment

A stretcher-leveler recently built by Hydropress, Inc. (R-941) is one of the largest ever made. It is of the self-contained oil-hydraulic type with a capacity of 825 tons and can accommodate plates or sheets up to 100 in. wide, and varying in length from 7 to 33 ft. One of the two gripheads is actuated by the hydraulic stretching cylinder, while the position of the other is adjustable to compensate for the varying length of the plates. Tension may be adjusted over a wide range when handling thinner and narrower plates.

At the other end of the scale is a roller leveler to flatten thin-gage sheet metals built by Voss Machinery Co. (R-942). Work rolls ¾ in. in diam-

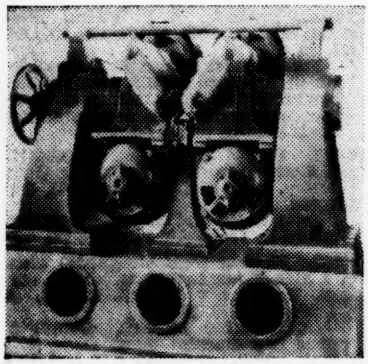


Hydraulic Plate Stretcher-Leveler Built by Hydropress

*Further information about the products described may be secured by using the Reader Service Coupon on page 63 specifying the appropriate R-number, or by writing direct to the manufacturers at the addresses on p. 17 and 53.

eter are probably the smallest ever built and will flatten sheets from 0.010 to 0.030 in. thick and up to 28 in. wide. All controls are from levers mounted on the top of the machine and a handwheel below. Contrary to the usual construction, the lower flight of rolls rather than the upper flight is movable.

In the tube mill, mandrel drawing not only permits a greater reduction per pass than plug drawing, but also gives a better inside finish to the tubes. The problem of relieving the tubing after drawing so that the mandrel may be readily removed is simplified by a new mandrel reliever, the Model GA 1 de-rodder built by Glengarry Machine Works (R-943). Keeping pace with



Glengarry De-Rodder

the latest high-speed drawbenches, this machine will operate at speeds up to 120 ft. per min. It will handle ferrous tubing up to ⅞ in. in diameter with wall thicknesses up to 0.065 in., and nonferrous tubing up to 1 in. in diameter. Transmission runs in oil for trouble-free service, and simple micrometer adjustments, when once set, require no further attention from the operator.

New instruments for the steel mill include the Measuray (R-944), made by Sheffield Corp. for oncontact gaging the thickness of moving material. Sheet, strip, plated material or tubing passes between an X-ray source and a detector, spaced sufficiently far apart to permit the necessary vertical movement. The Measuray compares the thickness of material with a sample of the required known dimension, and indicates variations of thickness in percentages. It may be equipped with indicating, recording or control devices, and may be used for either spot or continuous checking. Neither speed of travel nor temperature of stock affect accuracy.

Another new instrument is the Potter predetermined electronic counter (Potter Instrument Co., R-945), used to pile tin-plate as the sheets leave the flying shear. A photo-electric cell actuates the counter and a high-speed relay is used to control a deflector mechanism for channeling the tin-plate into the proper pile. The instrument can count up to 15,000 sheets per min.

Bearings and Lubricants

Patented wear resistant alloys, cast to shape, have been developed by Coast Metals, Inc. (R-946) for hot bar and billet mill guides. Shapes are finished to close tolerances on the wearing surfaces. Microstructure of these alloys consists of complex carbides with a high micro-scratch hardness, embedded in a tough austenitic matrix to resist shock. They have a low coefficient of friction and acquire a high polish in use. Resistance to wear is from 5 to 15 times better than that of hardened toolsteels.

Coast Metal castings are used in cold sheet and strip mills and other cold working operations, for guide rollers, bushings, sleeves, edging rolls, leveler rolls, scale breaker rolls, idler rolls, cold forming rolls, strander bushings and cradle bushings.

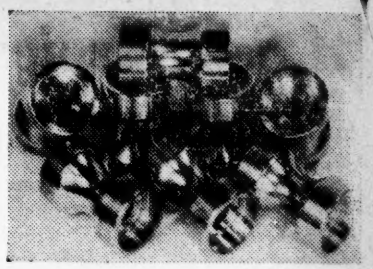
Indium bronze liners for guide pin bushings greatly increase the accurate life of die sets according to Standard Machinery Co. (R-947), manufacturer of this new product. Indium treated metals perform satisfactorily under bearing pressures up to 10,000 psi., Standard has found; at these high pressures normal films of oil lubricants puncture, and scuffing and scoring usually occur. Indium has inherent lubricating qualities which eliminate galling or seizure under temporary suspension of lubrication.

The liner is kept securely in position on the hard steel body by an internal groove. Shallow coined spherical impressions in the liner serve as oil pockets. Indium is electroplated over the entire bearing area and heat treated to form an alloy of high wear resistance as well as good lubricating qualities. The bushings are available in seven sizes ranging from 1 to 3 in. inside diameter.

Developed by Hangsterfer's Laboratories, Inc. (R-948), a new type of lubricant, J-2, for the cold forming and drawing of stainless steel has shown excellent performance, particularly for tube and rod drawing. Such workhardening material as A.I.S.I. Types 304, 316 and 347 can be cold reduced up to 55% without difficulty. No prior treatment of the surface, such as lead coating, pickling and lime coating, is necessary. Equally good results have been obtained with J-2 in working ferritic alloys of the high nickel-chromium type.

For cold working of brass, beryllium copper and aluminum, J-1, similar in composition but less viscous than J-2, has been developed.

A Glycolube series of lubrication compounds for drawing, sheeting and stamping nonferrous metals is being manufactured by Glyco Products Co., Inc. (R-949). Glycolubes apply a film which acts as a temporary corrosion inhibitor and permits continuous lubrication. They do not break down or produce scum. These compounds can be delivered with various combinations of properties to suit specific operating requirements. Properties are such as



Coast Metals Entry Guide Rollers for a 14-In. Morgan Finishing Mill

to give increased operating speeds and prolonged die life.

J. W. Kelley Co.'s Beacon No. 103 drawing compound (R-950) is a nonpigmented lubricant, readily removed from any workpiece to be enameled or bonderized regardless of time elapsed between die work and finishing. It is applied by brush or dip, may be cut to proper consistency with water, and contains no mineral oils. It is completely removed by a mild alkali cleaner, emulsified solvent or degreaser.

Forging Equipment

High-speed production is the feature of a new gravity drop hammer named the Ceco-Drop by Chambersburg Engineering Co. (R-951). It uses no boards or other form of friction lift, but relies upon air or steam to raise the ram. A simple clamp holds ram and rod at the top of the stroke. The clamp is released by an air valve actuated by the operator's foot treadle.

(Turn to page 11)

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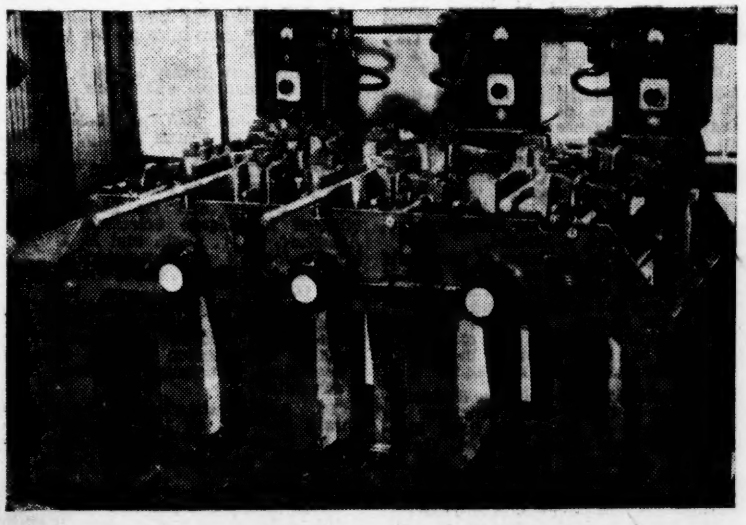
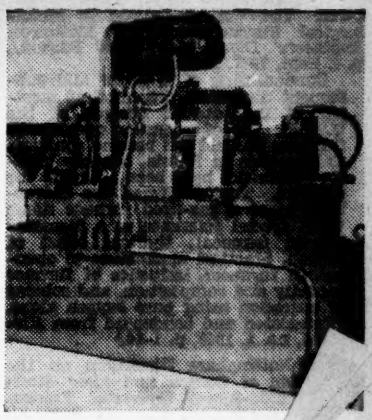
Bending, Press Brakes

Important innovations have also been announced in Pines bending machines for pipe, bars, tubes and extruded shapes (R-959). Fingertip control and built-in adjustments permit single duplication of a series of varying bends on each piece through an entire lot. Pressing the button starts a machine cycle which *(a)* activates clamp against work, *(b)* engages pressure die which feeds tangentially with the work into the bending die, *(c)* rotates bending arm to required angle of arc, *(d)* extracts mandrel (if one is used), *(e)* opens clamp, *(f)* releases pressure die, *(g)* returns arm, *(h)* advances mandrel to work position, and *(i)* indexes to next angle of bend.



Cheston Co.'s Resistance Heater for Forging



Pines Cutoff Machin

A two-operation bending die used on a 500-ton press built by Hydraulic Press Mfg. Co. (R-960) has had its life doubled and production cost cut by a "laminated" fabrication engineered by Lincoln Electric Co. The cylindrical die element used for closing is conventionally machined from toolsteel, while the larger bending element is built up by welding together a number of 1-in. plate sections which were flame cut to contour to produce both male and female halves in a single operation. Wear points are protected by Lincoln Abrasoweld. The press is used for bending the ends of strips of 1¼-in. plate, then closing the strip into ring form for welded exciter frames.

"The world's largest mechanical press brake" is now installed at the McKeesport, Pa., plant of the Jones & Laughlin Steel Corp., according to its manufacturer, the Warren City Mfg. Co. (R-961). This machine is designed to exert a pressure of over 1000 tons for bending to a right angle in a single stroke steel plate ⅝ in. thick and up to 36 ft. long. The brake makes 15 strokes per min., and has all moving parts counterbalanced by air cylinders. It weighs over 500,000 lb. without dies, and the flywheel alone weighs over 10,000 lb. The huge machine is controlled by one operator at a push-button panel.

For forming and bending of small precision parts the Di-Acro system of die-less duplicating was originated by O'Neil-Irwin Mfg. Co. (R-962) a few years ago. The basic units employed are a hand-operated shear, brake and bender. Instead of dies, standard

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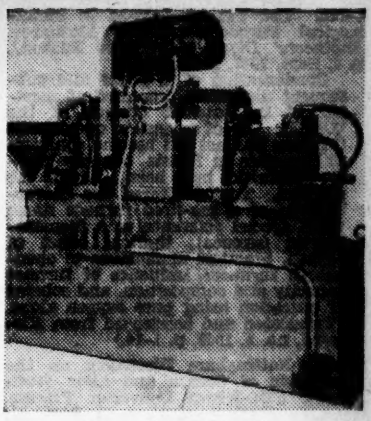
For cutting off lengths of pipe and tubing the latest models of Pines Engineering Co.'s flying cutoff machines will deliver up to 1500 pieces per hr. (R-958). These machines are fully automatic. The work is fed by motor-driven rolls through a hollow spindle and against an adjustable receding target stop. A rotating head automatically cuts the work to required length, producing a square face and holding end-to-end dimensions within a few thousandths of an inch. Operation is continuous until the machine runs out of stock. An entire machine cycle is completed in 1½ sec.

Bending, Press Brakes

Important innovations have also been announced in Pines bending machines for pipe, bars, tubes and extruded shapes (R-959). Fingertip control and built-in adjustments permit single duplication of a series of varying bends on each piece through an entire lot. Pressing the button starts a machine cycle which *(a)* activates clamp against work, *(b)* engages pressure die which feeds tangentially with the work into the bending die, *(c)* rotates bending arm to required angle of arc, *(d)* extracts mandrel (if one is used), *(e)* opens clamp, *(f)* releases pressure die, *(g)* returns arm, *(h)* advances mandrel to work position, and *(i)* indexes to next angle of bend.



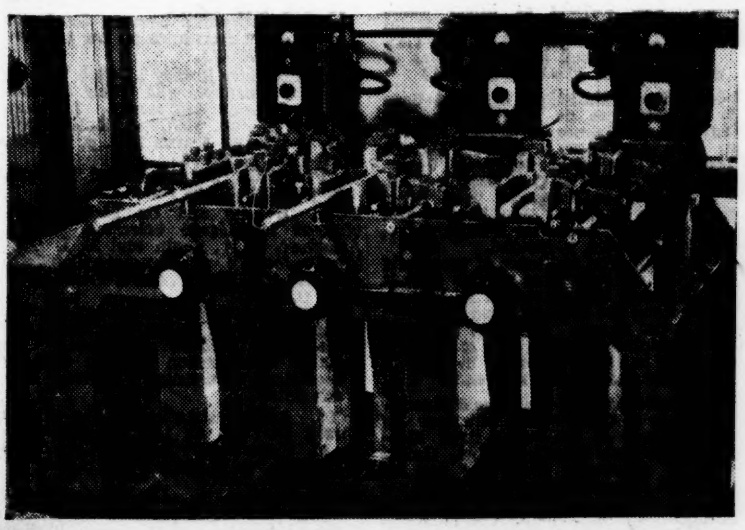
Pines Cutoff Machine

A two-operation bending die used on a 500-ton press built by Hydraulic Press Mfg. Co. (R-960) has had its life doubled and production cost cut by a "laminated" fabrication engineered by Lincoln Electric Co. The cylindrical die element used for closing is conventionally machined from toolsteel, while the larger bending element is built up by welding together a number of 1-in. plate sections which were flame cut to contour to produce both male and female halves in a single operation. Wear points are protected by Lincoln Abrasoweld. The press is used for bending the ends of strips of 1½-in. plate, then closing the strip into ring form for welded exciter frames.

"The world's largest mechanical press brake" is now installed at the McKeesport, Pa., plant of the Jones & Laughlin Steel Corp., according to its manufacturer, the Warren City Mfg. Co. (R-961). This machine is designed to exert a pressure of over 1000 tons for bending to a right angle in a single stroke steel plate ⅝ in. thick and up to 36 ft. long. The brake makes 15 strokes per min., and has all moving parts counterbalanced by air cylinders. It weighs over 500,000 lb. without dies, and the flywheel alone weighs over 10,000 lb. The huge machine is controlled by one operator at a push-button panel.

For forming and bending of small precision parts the Di-Acro system of die-less duplicating was originated by O'Neil-Irwin Mfg. Co. (R-962) a few years ago. The basic units employed are a hand-operated shear, brake and bender. Instead of dies, standard

(Turn to page 18)



Cheston Co.'s Resistance Heater for Forging

2-242. The Use of Oxygen in Metallurgical Furnaces. V. A. Mozharov. *Engineers' Digest (American Edition)*, v. 4, Sept. 1947, p. 433-435.

Condensation of a paper and subsequent discussion presented at meeting of Institute of Oxygen of the U.S.S.R. Use of oxygen in openhearth furnaces has not yet become commercial practice in Russia, but her highest authorities have been studying the problem. Topics covered are characteristics of a gas-fired furnace flame (with special reference to a Siemens-Martin furnace), thermal effect of oxygen, practical application to openhearth furnaces, influence of furnace capacity and composition, and scheme of operation using pure oxygen alone. (Translated and condensed from *Kislorod*, no. 1, 1946, p. 1-14.)

2-243. Nottingham Discussion on the Production of Carbon and Alloy Steels by the Side-Blown Converter Process. *Foundry Trade Journal*, v. 83, Sept. 11, 1947, p. 31-33.

Discussion of paper by F. Cousans presented at Annual Conference of Institute of British Foundrymen, Nottingham, England, June 18, 1947 (see July 24 issue).

2-244. Production of High-Strength Steels With Improved Machining Characteristics. F. O. Johnson. *Metal Progress*, v. 52, Oct. 1947, p. 565-567.

How machinability of certain important openhearth steels is improved to a gratifying degree, without any detectable loss in the usual physical test results, by addition of sodium sulphite.

2-245. The Refractory Metal Industry Since 1914. Allan L. Percy. *Metal Progress*, v. 52, Oct. 1947, p. 600-602.

Developments in production of the refractory metals (tungsten, molybdenum, tantalum, and columbium).

2-246. Aluminum-Silicon Alloys by Electrothermal Reduction of Clay With Coke. M. M. Striplin, Jr., and W. M. Kelly. *Chemical Engineering Progress (Transactions Section)*, v. 43, Oct. 1947, p. 569-578.

Experimental production of Al-Si alloys containing 25 to 70% Al, 25 to 70% Si, and small percentages of Fe and Ti, by reduction of clay or siliceous bauxite with coke in electric furnaces. Production of the alloys for use in steelmaking and as metallurgical reducing agents is believed to be economically promising. Possible use instead of silicon in aluminum casting alloys and as a starting material for production of aluminum and silicon.

2-247. Engineers Evaluate Use of Oxygen Enriched Air. *Steel*, v. 121, Oct. 13, 1947, p. 96, 98, 100, 103, 106, 108, 110, 113, 124.

Résumés of papers on the above subject, and also on the high top-pressure blast furnace at Cleveland, conditioning of stainless steel, lifting magnet design, soaking-pit operation, the powder process in stainless steel production, and multiple fuel burners for openhearth furnaces. (Presented at A.I.S.E. Meeting, Pittsburgh, Sept. 22-25, 1947.)

2-248. Depolarization With Sulphur-Dioxide-Containing Gases in Electrolytic Extraction of Copper From Sulphate Solutions. V. V. Stender and I. E. Bauslit. *Journal of Applied Chemistry (U.S.S.R.)*, v. 20, no. 3, 1947, p. 155-162. (In Russian.)

Details of an attempt to utilize the waste gases from copper refining to decrease the energy consumption (by decrease of anode potential) during electrochemical extraction of copper and to prepare H_2SO_4 by introduction of purified SO_2 into a porous carbon anode during electrolysis. 13 ref.

2-249. Discussion at a Combined Meeting on Side-Blown Converter Practice. *Journal of the Iron and Steel Institute*, v. 157, Sept. 1947, p. 99-114.

Joint meeting of British Iron and Steel Research Assoc. and Iron and Steel Institute, March 20, 1947. Concerned with the converters, their refractories, and their operation.

2-250. Ferrous Metals—Their Production and Properties. S. L. Case. *Metals Review*, v. 20, Oct. 1947, p. 5-7, 45.

Highlights of research and development as reflected in recent technical literature. Ore beneficiation, blast-furnace practice, openhearth process, use of oxygen, properties of steel.

2-251. Products and Processes for the Steel Plant. *Metals Review*, v. 20, Oct. 1947, p. 9, 11, 13, 15, 17, 19.

New production equipment and improved compositions as described by the manufacturers. Ore handling and treatment; oxygen for the openhearth; openhearth, electric, induction melting equipment; refractories; steel plant laboratory equipment. Addresses of manufacturers mentioned.

2-252. Melting High-Speed Steel in the Basic Electric Arc Furnace. H. C. Bigge. *Iron Age*, v. 160, Oct. 16. 1947. p. 118-136.

A comprehensive description of the production of an 18-4-1 heat, including a step-by-step melting procedure. It is correlated with metal analysis, slag analysis, and power requirements. Metal and slag analyses, at seven stages of the heat, and the relationship of these two factors to the color of the respective slag samples. Color photographs of the slag at the seven stages.

For additional annotations indexed in other sections, see:
3-303; **16**-127; **27**-228.

166 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

3 PROPERTIES OF METALS AND ALLOYS

3-295. The Physics of Sheet Steel. (Continued.) G. C. Richer. *Sheet Metal Industries*, v. 24, Sept. 1947, p. 1783-1785.

Magnetostriction and the stages of magnetization. (To be continued.)

3-296. Etude Statistique des Variations de la Résilience de l'Acier Moulé au Carbone, de Nuance Mi-Douce Elaboré au Four Electrique a Arc en Marche Basique. (Statistical Study of Variations in Resilience of Cast Carbon Steel, Semi-Mild Type, Prepared in a Basic Electric Arc Furnace.) Paul Bastien and Louis Alanore. *Revue de Métallurgie*, v. 43, Nov-Dec. 1946, p. 289-296.

The standard resilience of semi-mild cast carbon steel from a basic electric arc furnace decreased 0.25 kg. per sq. mm. when the breaking load increased 1 kg. per sq.mm. Attempts to eliminate sulphur and increase manganese content to 0.8% were made in order to maintain satisfactory resilience.

3-297. Influence des Additions d'Aluminium et de la Composition Chimique sur la Résilience de l'Acier Mi-Doux Electrique aux Etats Moulé or Forgé. (Influence of Aluminum Additions and of Chemical Composition on the Resilience of Cast or Forged Semi-Mild Electric Steel.) Paul Bastien and Claudius Dubois. *Revue de Métallurgie*, v. 43, Nov-Dec. 1946, p. 297-306.

Aluminum additions to rough cast steels are detrimental to its resilience. However, additions to forged annealed steel increase resilience. By keeping aluminum additions to a minimum, values for acid steels may approach those for basic steels.

3-298. Quelques Résultats Relatifs a la Résistance a la Fatigue sur les Métaux Légers. (Some Data Concerning the Resistance to Fatigue of Light Metals.) R. Chevigny. *Revue de Métallurgie*, v. 43, Nov-Dec. 1946, p. 330-335.

Data indicating the action of various factors on the fatigue limits of industrial aluminum alloys.

3-299. Effetto dell'Incrudimento Dopo Bonifica Sulle Proprieta delle Leghe Al-Mg-Si da Lavorazione Plastica. (Effect of Roughness After Treatment on the Workability of Al-Mg-Si Alloys.) C. Panseri and M. Monticelli. *Alluminio*, v 16, May-June 1947, p. 193-198.

Using an alloy containing 0.9 to 1.1% Si, 0.7 to 0.8% Mg, 0.6 to 0.8% Mn, traces of Cu and Fe, and the rest aluminum as an example, the effect of roughness on the mechanical characteristics of test specimens is discussed. A notable increase in corrosion resistance is observed after working.

3-300. Contribution a l'Etude des Fontes Spéciales a Haute Résistance Mécanique. (Contribution to the Study of Special Cast Irons, Having High Mechanical Resistance.) Georges Delbart and Rubin Potaszkin. *Fonderie*, June 18, 1947, p. 673-683.

Twelve heats of slightly varied composition were tested to determine the effect of carbon and silicon content on the mechanical properties and porosity of highly resistant cast irons. Inoculation with calcium silicide was found to be very satisfactory. 11 ref.

3-301. Superalloys. Part II. Walter G. Hildorf. *Western Machinery and Steel World*, v. 38, Sept. 1947, p. 126-129.

Concludes summary of the properties of 16-25-6 alloy (16% Cr, 25% Ni, 6% Mo) as affected by various treatments. Some of the properties are charted and tabulated in comparison with other high-temperature alloys.

3-302. Prispevek k Otazce Napousteci Krehkosti Oceli. (Contribution to the Problem of Temper Brittleness in Steel.) Fr. Poboril and V. Koselev. *Hutnické Listy*, v. 1, Nov. 1946, p. 97-101; Dec. 1946, p. 130-133; Jan. 1947, p. 155-158.

Results of experiments show that in steel having "permanent" temper brittleness, impact resistance as well as toughness increase at the same tensile strength with increasing temperature. It was also shown that there is a linear relationship between toughness and impact resistance at low temperatures (—78° C.).

3-303. Beryliove Bronzy a Jejich Vyroba. (Beryllium Bronzes and Their Production.) Jaroslav Malkovsky. *Hutnické Listy*, v. 1, Jan. 1947, p. 145-147; Feb. 1947, p. 173-176; March 1947, p. 203-206; April 1947, p. 228-229.

Properties, structure, and methods of production. 25 ref.

3-304. Density and Its Thermal Coefficient for Liquid Selenium. K. V. Astakhov, N. A. Penin and E. I. Dobkina. *Journal of General Chemistry (U.S.S.R.)*, v. 17 (79), no. 2, 1947, p. 378-381. (In Russian.)

Experimental method for measuring the density of molten selenium and results obtained in the range 218 to 405°. An equation for the thermal coefficient of density is derived from the data.

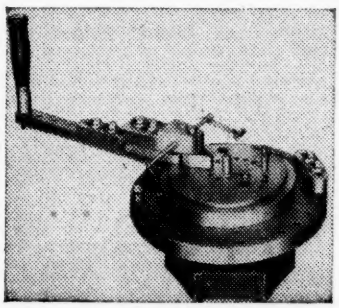
3-305. An Investigation of the Stress-Strain Diagram at Low Temperatures. E. M. Shevandin. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 858-870. (In Russian.)

Experimentally determined stress-strain diagrams are presented and discussed for three carbon steels (0.12 to

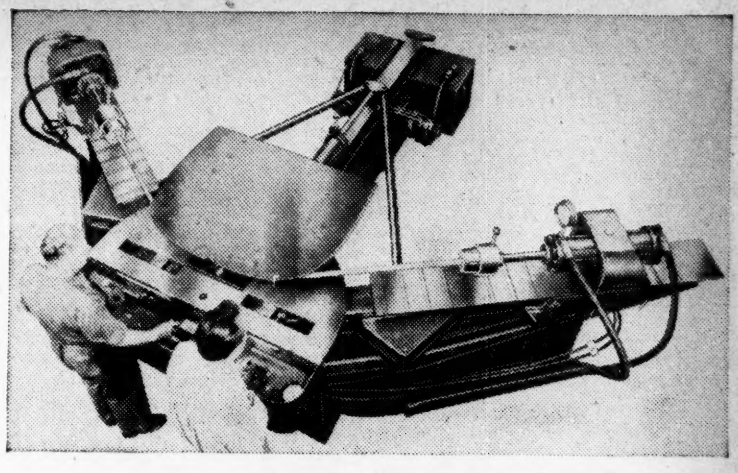
(Turn to page 14)

forming blades are supplied with the machine. The units can be easily converted on the job for duplicating unusual shapes and complicated parts.

The Di-Acro brake was entirely redesigned some months ago and additional models of the bender having larger material and radius capacities were added. The latest is the Di-Acro bender No. 1A, designed for contour forming all types of ductile materials in rounds, half-rounds, hexagon and square rod, tubing, angles, channels, molding, strip stock and busbars. Also added to the line is a rod parter for cutting off rods and bars. It comes in two sizes to accommodate ⅜ and ⅝-in. bars.



Di-Acro Bender



Hufford Hydraulic Stretch-Forming Machine

Sheet Metal Forming

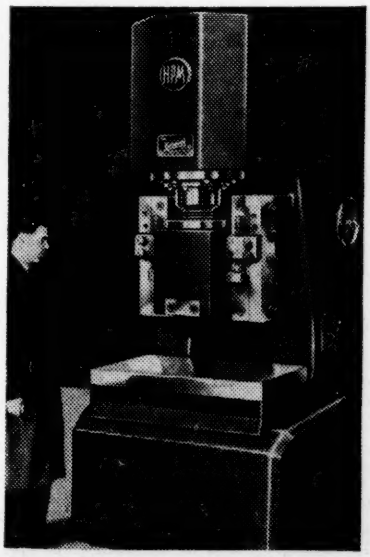
A simplified routine process for making stage dies invented by Solar Aircraft Co. engineers (R-963) is known as the Sol-A-Die process. The unfolding of a flexible wax and cheesecloth pattern and using it as a form for stage die patterns replaces the conventional deep draw with two far simpler components—a shallow draw expanding the metal into its full area, and then a series of subsequent dies folding the deformed part into its final shape without further extension of the metal. Since the necessary deformation can generally be accomplished between relatively flat dies with easy slopes, there is little tendency for undue local stretching of the metal. Surface scratching is almost entirely eliminated. An example of how this process was applied to the forming of an aircraft part from 24S-O Alclad sheet was described in the August issue of *Metals Review*, page 15.

Another outgrowth of aircraft production methods is the stretch forming of structural shapes such as extrusions, strip, sheet, roll and bar stock. Hydraulic stretch forming machines made by Hufford Machine Works (R-964) impart tension to the workpiece, simultaneously wrapping it around a fixed-position die. Springback is virtually eliminated; dies are inexpensive, can be produced directly from engineering drawings, and are easily reworked to obtain exact dimensional tolerance of the workpiece. Tension during contouring operations eliminates the tendency of the work to wrinkle. Physical characteristics of the metal are generally improved, and localized strains are absent. A new and modified design, the Hufford Model 50, is suitable for skin stretching sheet stock up to 10 ft. by 42 in.

Hydraulic Presses

Cycling at the unprecedented speed of 100 strokes per min., a 50-ton, all-hydraulic, open-back, inclinable press has been offered to industry for the first time by Hydraulic Press Mfg. Co. (R-965). Called the "Economy Press", the new machine offers the advantages of constant drawing speed, elimination of high impacts, steady squeeze during the drawing operation, and automatic reversal at a predetermined pressure.

Ram speeds are adjustable depending on the type of work; speed is constant from the time the head contacts the work until the draw is completed.



H.P.M. Economy Press

Pressing motion is straight, without side thrust. The press is equipped with a precision inching control, so that the ram may be advanced very slowly when the mechanic is setting the dies. Power is supplied by a 7½-hp., 1800-r.p.m. motor direct-connected to a radial pump. Pressure output of the pump is adjustable from 15 to 50 tons.

High speed is also a feature of an oil-hydraulic, double-action, deep drawing press built by Hydropress, Inc. (R-966). The main slide on this press has a capacity of 100 tons, while the blankholder slide has a capacity of 50 tons. Both slides may be coupled to obtain a total capacity of 150 tons for single-action work. Drawing speed can be up to 225 in. per min. at pressures up to 100 tons on the main slide; advance and return speeds run up to 1200 in. per min. The complete oil-hydraulic drive with pumps and motors is mounted on the frame. Control may be manual, semi-automatic or fully automatic.

A grown-up version of Denison Engineering Co.'s Multipress has made its appearance in the form of a new one of 75 tons capacity (R-967). The "vibratory control" feature of the smaller models offers a wide range of ram actions and controls, unique in a press of this large size. With four strain rods and a choice of three valve combinations, it will meet practically every pressing cycle within a range of 7½ to 75 tons.

Large Mechanical Presses

Thunder Bay presses, manufactured by Die Tool Engineering Co. (R-968) are now available in 100, 150, 200, 250 and 300-lb. capacities in a variety of bed sizes. The 150-ton model has a 41x84-in. bed and weighs approximately 37,000 lb. Features include double back gearing, Rockford friction clutch, ball bearing release, one-shot lubrication.

The new and improved Chambersburg trimming press (R-969), designed by Chambersburg Engineering Co. pri-

(Turn to page 15)

0.4%), a 5%-Ni steel, and copper, at various temperatures from 20 to −196°. Effects of different annealing temperatures.

3-306. Les Nouveaux Alliages Al-Mg-Zn A Hautes Caracteristiques Mecaniques: Zicral. (New Al-Mg-Zn Alloys Having Good Mechanical Characteristics: Zicral.) Part II. Pierre Vachet. *Revue de l'Aluminium*, v. 24, July-Aug. 1947, p. 225-233.

Methods of preparing and treating the Al-Mg-Zn alloys in use today. Comparison of the properties of Zicral and duralumin, Zicral being shown to have the better properties. Its Zn content is normally about 7.5%.

3-307. Behavior of Metal Cavity Liners in Shaped Explosive Charges. George B. Clark and Walter H. Bruckner. *Metals Technology*, v. 14, Aug. 1947, T.P. 2158, 12 p.

Previously published in *Mining Technology*, May 1947. (Annotated under item 3-168.) (Presented at New York Meeting of A.I.M.E., March 1947.)

3-308. A Statistical Theory of Fracture. J. C. Fisher and J. H. Hollomon. *Metals Technology*, v. 14, Aug. 1947, T.P. 2218, 16 p.

The possibility of developing a quantitative theory of fracture. A further effort is to rationalize by statistical analysis the size effect in solids, the scatter of fracture-stress values and dependence of fracture stress upon strain, and to make an approach to quantitative relations between structure and fracture stress. (Presented at Atlantic City Meeting of A.I.M.E., Nov. 1946.) 23 ref.

3-309. Influence of Plastic Deformation, Combined Stresses, and Low Temperatures on the Breaking Stress of Ferritic Steels. D. J. McAdam, Jr., G. W. Geil, and R. W. Mebs. *Metals Technology*, v. 14, Aug. 1947, T.P. 2220, 40 p.

Attention is confined to stress combinations that are produced by tension tests of notched or unnotched cylindrical specimens. Chief attention is given to experiments in which the specimen is first given a chosen amount of plastic deformation at room temperature and then tested to fracture at −188° C. By this means a study was made of the influence of plastic deformation and of the stress system on stress at cleavage fracture. 24 ref. (Presented at New York Meeting of A.I.M.E., March 1947.)

3-310. Anomalous Changes in Tensile Properties of Quenched Iron-Cobalt (35% Co) Alloys. James K. Stanley. *Metals Technology*, v. 14, Aug. 1947, T.P. 2221, 11 p.

Fourteen Fe-Co alloys, containing 35% Co, were quenched from various temperatures in water at 0° C. and their mechanical properties determined. Metallographic examination, lattice-constant determination, and aging treatment were used in order to obtain further information. (Presented at New York Meeting, A.I.M.E., March 1947.)

3-311. Cast Steels: Recent Developments Concerning Properties. Charles W. Briggs. *American Foundryman*, v. 12, Sept. 1947, p. 37-43.

Information obtained during the past 2 years, in the course of research for the Steel Founders' Society of America, at Carnegie Tech., Case, and Michigan College of Mines and Technology. Comparisons with wrought steels. (Presented before Semi-Annual Meeting of A.S.M.E., Chicago, June 16-19, 1947. To be continued.)

3-312. Austenitic Malleable Iron—a New Ferrous Material. C. K. Donoho. *Materials & Methods*, v. 26, Sept. 1947, p. 85.

Properties and applications of a modified Ni-Resist cast iron processed to provide a malleable rather than a gray iron structure. This results in a corrosion resistant material with good strength and ductility.

3-313. Properties and Applications of Molybdenum. J. Gelok. *Materials & Methods*, v. 26, Sept. 1947, p. 86-89.

Production of molybdenum by powder-metallurgy methods which permit application to a large number of miscellaneous uses for which it was not previously available because of size and other limitations.

3-314. Cast Iron and Steel. (Continued.) Ernest C. Pigott. *Iron and Steel*, v. 20, Sept. 1947, p. 442-444; Oct. 1947, p. 476-478.

Effects and applications of cast iron and steel alloyed with phosphorus, selenium, silicon, sulphur, tantalum, tellurium, tin, titanium, and tungsten.

3-315. The Theory of the Magneto-Resistance Effects in Metals. E. H. Sondheimer and A. H. Wilson. *Proceedings of the Royal Society (Series A)*, v. 190, Sept. 9, 1947, p. 435-455.

General formulas for the effect of a magnetic field on the electrical and thermal conductivities of a metal in which there are two overlapping bands of normal form. Simple formulas are set up which reduce to correct expressions in the cases of high and low temperatures and very strong magnetic fields. 17 ref.

3-316. High-Strength Cast Irons for Gears. E. M. Currie. *Machinery (London)*, v. 71, Sept. 11, 1947, p. 291-295.

The selection of gear material. Information concerning the properties and structure of the various types, with emphasis on the superiority of the meehanites.

3-317. High-Temperature Metals. L. N. Rowley and B. G. A. Skrotzki. *Power*, v. 91, Oct. 1947, p. 79-94.

Recent developments, beginning with a review of fundamental principles. Structure, properties, testing, temperature effects, and design. Typical compositions and properties.

3-318. Abrasion Resistance of White Cast Iron Improved by Suitable Alloying. *Steel*, v. 121, Oct. 6, 1947, p. 184, 186.

Reviews talk by Kenneth A. DeLonge of International Nickel, before Salt Lake City Meeting of A.S.M.E.

3-319. Zur Theorie der Metalle. (On the Theory of Metals.) P. Gombás. *Müegyetemi Kozlemények*, no. 1, 1947, p. 25-29.

Solids are divided into 5 groups, one of which is metals; a statistical model is developed and electron potentials calculated for the valence electrons of metals.

3-320. Influence de la Teneur en Manganèse sur le Recuit de la Malléable a Coeur Noir. (Influence of Manganese Content on the Annealing of Black-Heart Malleable Iron.) Gabriel Joly. *Fonderie*, July 1947, p. 734-735.

Contents up to 0.35 to 0.40% were satisfactory where the sulphur content was 0.07 to 0.09%. Suggests maintaining the more usual figures (0.20 to 0.25%) for assured results.

3-321. Théorie de l'Anisotropie de Certains Aciers a Aimants Traités a Chaud dans un Champ Magnétique. (Theory of Anisotropy of Certain Magnetic Steels Heat Treated in a Magnetic Field.) Louis Neel. *Comptes Rendus*, v. 225, July 16, 1947, p. 109-111.

The magnetic anisotropy of alloys containing iron, nickel, and aluminum and a method for determining the order of magnitude of the anisotropic energy.

3-322. Variation de Champ Coercitif en Fonction de la Densité de Poudres Ferromagnétiques Agglomérées. (Variation in the Coercive Field as a Function of the Density of Agglomerated Ferromagnetic Powders.) Louis Weil. *Comptes Rendus*, v. 225, July 28, 1947, p. 229-230.

The law that agglomerated ferromagnetic powders have a decreasing coercive field, the greater the density of agglomeration, is verified by the author using iron and ferrocobalt powders.

3-323. Samband Mellan Stals Analys Och Härdbarhet Enligt Myare Amerikanska Arbeten. (Relationship Between Steel Analyses and Hardenability According to Recent American Work.) *Jernkontorets Annaler*, v. 131, no. 8, 1947, p. 271-288.

Work on hardenability, most of which has been published in the American literature, with emphasis on methods of quantitative determination and calculations. 27 ref.

3-324. Stollingsverschijnselen Bij Metalen. (Solidification Phenomena in Metals.) W. F. Brandsma. *Metalen*, v. 1, Aug. 1947, p. 231-234.

The solidification process of a binary alloy with an eutectic composition and of a binary alloy with a continuous series of compound crystals.

3-325. Influence of Structure and Composition on the Elastic Properties of Metallic Alloys. L. Guillet. *Engineers' Digest (American Edition)*, v. 4, Sept. 1947, p. 429-432.

Two pieces of test equipment for measuring elastic properties of metals: LeRolland-Sorin's apparatus for measurement of elastic moduli and Chevenard's micro-pendulum for torsion tests. Relative influence of metallographic factors no the elastic constants of metals. Elastic modulus is only slightly affected by composition or structure, but damping capacity (internal friction) is very sensitive to these changes. Therefore alloying, heat treatment, or cold work can be used to avoid dangerous resonance vibration stresses. (Translated and condensed from *Le Genie Civil*, v. 124, Feb. 1, 1947, p. 45-50.)

3-326. Preferred Orientations in Drawn and Annealed 70-30 Alpha Brass Tubes. Walter R. Hibbard, Jr. *Metals Technology*, v. 14, Sept. 1947, T.P. 2245, 4 p.

Preferred orientations in drawn 70-30 alpha-brass tubing were rationalized on the basis of a double texture with the {111} pole and the {100} pole parallel to the drawing direction and a random orientation about these directions as an axis. This texture is similar to that found in drawn alpha-brass wire. Hard drawn tubes with well developed textures did not crack when subjected to the standard mercurous nitrate test in spite of heavy reductions in diameter. The role of preferred orientations in reducing the tendency of metals toward intergranular cracking of the mercury type. 12 ref.

3-327. The Apparent Yield Strength of Plain Carbon Steel. J. A. Pope. *Engineering*, v. 164, Sept. 19, 1947, p. 284-288.

The present state of knowledge of yield strength of plain carbon steel is analyzed and suggestions are made concerning size and stress-distribution effects, in order to bring the various test results into agreement. (Condensed from paper read before Sec. G of the British Association, Dundee, Sept. 2, 1947.)

3-328. Upper Yield Point: Occurrence in Bending Tests and Signification. Carl Benedicks and Roman Skorski. *Nature*, v. 160, Sept. 20, 1947, p. 399.

Experiments on soft iron wire and carbon steel show drop in stress after the yield point, or beginning of permanent elongation. This upper yield point is present when there is a hard skeleton in the grain boundaries.

3-329. Supersonic Wave Penetration Into Materials. Benson Carlin. *Product Engineering*, v. 18, Oct. 1947, p. 169.

Table of experimental values of approximate maximum depth of penetration in specific samples.

3-330. Mechanical Properties of Aluminum-Magnesium Alloys at the Temperature of Liquid Oxygen. A. B. Fradkov. *Kislorod (Oxygen)*, 4th vr., Jan-Feb. 1947. p. 54-55. (In Russian.)

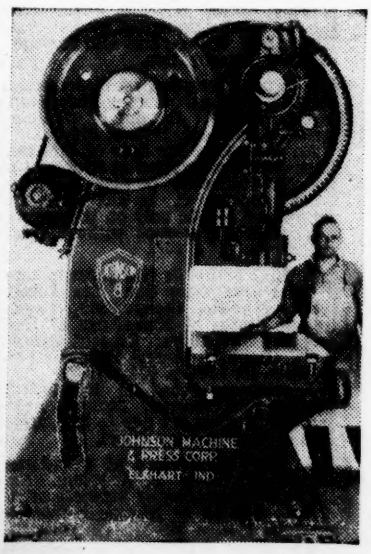
Results of tests on 5 and 7% Mg

(Turn to page 16)

marily for forge shop use, is also applicable for all forms of blanking, punching, bending and shaping. A patented forged steel side construction and the friction slip mechanism, which permits the flywheel to expend its energy at predetermined loads, make the press virtually indestructible. Easy accessibility to front and back is attained by arranging the flywheel and gearing at the side of the press rather than at the top. Single-geared and double-geared models, as well as single-crank and double-crank presses, are available.

Precision attained by skilled engineering, careful craftsmanship and quality control during manufacture is the outstanding characteristic of a new line of "General" punch presses distributed by DoAll Co. (R-970). Centrifugally cast bronze bearings are diamond bored and carefully fitted. Extra long bronze gibs, as well as V's of the slide, are precision machined and hand scraped. Wear-compensating adjustments assure accuracy. Exact alignment of slide increases die life. Other features are safety precautions and one-unit clutch and brake. The presses are made with two types of one-piece bases—either inclined or inclinable; standard sizes are 30, 40, 50 and 60 tons.

DoAll has also developed the Continental Process (R-971) for making stampings in small lots, which involves a different procedure in design and construction as well as use of the die. Dies are made of very thin sections of steel. The punch is a "floating" punch. The dies are not mounted, and are operated with a shuttle action which brings them in and out of the punch press for each impression. The Continental Process requires two sets of special equipment, installed in two standard punch presses. The process is primarily suited for small runs of up to 10,000 stampings. Because of low die cost and quick delivery, 100 stampings can be produced for the cost of a few hand-made samples. Accuracy is equivalent to parts made in conventional dies.



90-Ton Inclinable Power Press

A 90-ton inclinable power press is the newest and largest in the line made by Johnson Machine and Press Corp. (R-972). It can handle work up to 15 in. in depth and turns out 44 pieces per min. An extra thick bolster plate provides strength for heavy operations without reducing die space. An interchangeable thin steel bolster is available to give greater-than-normal die space.

Stress analysis by strain gages has resulted in several improvements in the new punch presses made by Diamond Machine Tool Co. (R-973). With no increase in weight of main casting, frame strengths as high as five times rated capacity have been obtained. The company is now producing an open-back inclinable press in 55 and 56-ton capacities, to add to its line of 9, 14, 30 and 31-ton models. The 31-ton press, introduced earlier this year, differs from the 30-ton (and the 56 from the 55-ton) by the addition of back gears and stronger frame design.

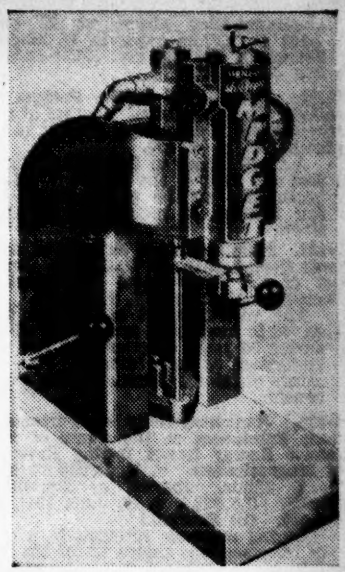
From 180 to 500 press strokes per min. can be achieved in the new 9, 10, 19 and 30-ton open-back inclinable punch presses made by Fast Feed Machine Co. (R-974), which are equipped with a motor designed for fingertip variable speed control.

A 30-ton combination shear and press known as the Multi-Max press is offered by Parker Mfg. Co. (R-975). Mechanically operated, it shears, blanks, notches, punches, perforates, slots, pierces, lances, bends and forms sheet metal parts in single or multiple units, with one operator. Since the Multi-Max needs no special foundation, has no overhanging parts and requires only 36x75 in. of floor space, it can be moved in and out of the production line as required.

Smaller Presses

A 12-ton high-speed automatic punch press with automatic roll feed and variable speed drive has been introduced by Di Machine Corp. (R-976). It accommodates standard die sets measuring to 8½x6¼ in. or special sets measuring to 8x12 in. The shut-die height over the bolster plate is 6 in. An adjustable automatic roll feed mechanism, which operates from an eccentric on the crankshaft, is an integral part of the machine. Length of feed is adjustable to 6 in., and stock to 4½ in. wide may be used. The variable speed drive provides 65 to 300 press strokes per min.

A 10-ton model has been added to the line of hydraulically operated assembly presses made by Colonial Broach Co. (R-977). With a maximum adjustable stroke of 12 in., the press has a power stroke speed of 180 in. per min. Working pressure is 1200 psi. max., adjustable through a dial to any desired lower amount—a feature particularly advantageous when assembling relatively delicate parts.



Multipress Midget

Air-Hydraulics, Inc., has a new 10-ton foot-operated hydraulic arbor press (R-978) for machine shops and toolrooms for press fitting, staking, assembly, riveting and crimping. Pressure is controlled by a foot pump unit in which a stroke of the center pedal moves the ram ⅞ in. down to work. The right pedal or power pump moves the ram down ⅛ in. with each stroke, and a kick on the left pedal returns the ram to its original position. Air-Hydraulics is also making a very small press (1200 lb. capacity) with 6-in. throat, 2½-in. stroke, ¾-in. ram and 5-in. square platen (R-979). Lugs in the base make it suitable for bench mounting.

Especially designed for pressing requirements between 200 and 2000 lb. ram effort, the new Multipress Midget made by Denison Engineering Co. (R-980) offers all the features of the larger Multipresses. It is suited for multiple or gang installations and for successive operations. One centralized power source will operate up to 12 units. When more than one Midget is used, each has individual pressure adjustments. It may be operated in any position, and is easily adaptable to other hydraulic machinery as an accessory unit for pressing, clamping, feeding and other production tasks.

Press Accessories

An automatic friction roll feed manufactured by Benchmaster Mfg. Co. (R-981) will fit a majority of standard punch presses as well as the Benchmaster line. The friction drive is geared down to give anything up to 3-in. adjustment in feed. Stock to 3 in. wide can be accommodated and adjustment for thickness is in thousandths of an inch from 0 to ⅛ in.; height adjustment is from 0 to 2¼ in.

(Turn to page 17)

aluminum-alloy sheet at 20 and −183° C. (From paper by H. Mader, *Zeitschrift fur die ges. Kalte-Industrie*, June 1942.)

3-331. Introduction to the Fatigue of Metals. H. H. Egginton. *Journal of the Birmingham Metallurgical Society*, v. 27, March 1947, p. 258-278.

A short history of fatigue investigation and some of the factors of prime importance to the phenomenon. A few features of metals under cyclic stress.

3-332. Investigation of Failures of Aircraft Components. C. W. George. *Journal of the Birmingham Metallurgical Society*, v. 27, June 1947, p. 308-338.

The various types of failures observed in nonferrous metals and alloys during 30 years experience in the investigation of such failures. Possible causes of failure in various alloy components.

3-333. Nonhomogeneity of Ferromagnetic Substances as the Cause of Excessive Energy Losses During Reversal of Magnetization. V. V. Druzlinin and R. I. Janus. *Journal of Technical Physics (U.S.S.R.)*, v. 17, June 1947, p. 641-650. (In Russian.)

During magnetic reversals in a pile of ferromagnetic sheets, under the influence of induced current, energy losses are caused by hysteresis, eddy currents, and a third factor previously known as "magnetic aftereffects". The latter are now ascribed to inhomogeneities in the ferromagnetic materials on the basis of the experimental results.

3-334. The Reaction Between Carbon and Oxygen in Liquid Iron. J. D. Fast. *Philips Research Reports*, v. 2, June 1947, p. 205-227.

Chemical constants of the above reaction are derived from a consideration of the equilibrium between a liquid-iron phase in which small quantities of oxygen and carbon are dissolved, and a gas phase consisting of a mixture of CO and CO_2. 33 ref.

3-335. The Temperature-Magnetic Hysteresis of Ferromagnetic Substances. Ia. S. Shur and V. I. Drozlizhina. *Journal of Experimental and Theoretical Physics (U.S.S.R.)*, v. 17, July 1947, p. 607-613. (In Russian.)

Magnetization of Ni and Fe-Si specimens under a constant magnetic field and cyclic variations in temperature.

3-336. Creep Rate of Various Industrial Leads. J. Neill Greenwood and J. H. Cole. *Metallurgia*, v. 36, Sept. 1947, p. 233-235.

Results of creep-rate determinations on industrial leads from various sources compared with results for some synthetic laboratory products. It is shown that total impurity content is no guide to creep behavior. Suggests 100-day test under 500 psi., followed by embrittlement determination and metallographic examination for evaluation of commercial lead alloys.

3-337. Fatigue of Ferrous Materials; Some Factors That Influence Resistance to the Damaging Effect of Fatigue Stressing. *Metallurgia*, v. 36, Sept. 1947, p. 249-251.

Discusses several papers presented at recent meeting of the A.S.T.M. concerning damaging effect of fatigue, means of improving the fatigue resistance of low-alloy steel axle shafts, fatigue tests on steel under compressive stress, and the fatigue testing of ball and roller bearings.

3-338. The Fluidity of Steel. R. Jackson, D. Knowles, T. H. Middleham, and R. J. Sarjant. *Journal of the Iron and Steel Institute*, v. 157, Sept. 1947, p. 1-21.

Results of experiments on the fluidity-temperature relationships, as indicated by Ruff and Spiral mold tests, of four steels—2% Cu steel, Si-Ni steel, low-carbon steel, and 13% Mn steel, melted in high-frequency furnaces with acid and basic linings. The Spiral mold gave more consistent results than the Ruff. Comparison of the results with those of Taylor, Rominski, and Briggs on similar steels showed widely differing fluidity-temperature relationships with similar molds. Investigation of the pyrometric methods used indicates that the differences were mainly caused by time lag in the American temperature measurements.

3-339. Deformation of Metals During Single and Repeated Tensile Impact. J. A. Pope. *Journal of the Iron and Steel Institute*, v. 157, Sept. 1947, p. 31-54.

The falling-tup type of machine was used and an adjustable stop was fitted to the machine so that either a single impact could be split up into a number of stages or repeated impact tests could be carried out with constant velocity of deformation. The mode and spread of deformation were examined by microscope, by Vickers hardness tests, and by measuring the change in diameter of the specimen at various points. The metals tested were Lowmoor iron and mild steel. A general theory expressed in dimensionless groups is developed to explain the mode of deformation. This gives good agreement with experimental results. It was found that the spread of deformation during impact is fundamentally different from that for static deformation. 12 ref.

3-340. Discussion on Papers, Spring Meeting, 1947. Discussion on a Symposium on the Hardenability of Steel. *Journal of the Iron and Steel Institute*, v. 157, Sept. 1947, p. 55-80.

Discussion at meetings and written contributions relative to the papers included in the above symposium (Special Report No. 36). Authors' replies will be published later.

3-341. The Reflectivity of Speculum Metal. S. Tolansky. *Journal of Scientific Instruments*, v. 24, Sept. 1947, p. 248-249.

Reflectivities of electrodeposited speculum and of speculum prepared by vacuum evaporation were determined over the range 4500-6500A. The higher reflectivity of evaporated speculum as compared with electrodeposited speculum of the same composition is attributed to the greater perfection of the evaporated mirror surface and consequent reduction in the amount of nonspecular reflection.

3-342. Stability of Steel at Elevated Temperatures. A. B. Wilder and J. D. Tyson. *Steel*, v. 121, Oct. 20, 1947, p. 86-89, 108, 111.

Scope of extensive research program being conducted on high-temperature piping materials at National Tube Co., Lorain, Ohio.

For additional annotations indexed in other sections, see:
2-233-236-240-250-251; **4**-140-147-167-171; **5**-71; **7**-389; **9**-138; **11**-144; **18**-211-212; **20**-560-575; **22**-589; **23**-379-405; **27**-224.

265 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

4 STRUCTURE — Metallography & Constitution

4-138. Total Cross Section of Aluminum for Fast Neutrons. L. W. Seagondollar and H. H. Barschall. *Physical Review*, v. 72, Sept. 15, 1947, p. 439-444.

Results of measurement of the total neutron cross section of aluminum as a function of neutron energy in the range from 10 to 1000 kev.

4-139. Le Role des Joints Intergranulaires dans la Déformation des Métaux. Application au Fluage et a la Fatigue. (The Role of Intergranular Seams in the Deformation of Metals. Application to Creep and Fatigue.) Ch. Crussard. *Revue de Métallurgie*, v. 43, Nov-Dec. 1946, p. 307, 317.

Investigation of the deformation of metals having hexagonal and cubic crystals. 18 ref.

4-140. Fatigue et Effet Bauschinger. (Fatigue and the Bauschinger Effect.) Pierre Laurent and Michel Ferry. *Revue de Métallurgie*, v. 43, Nov-Dec. 1946, p. 327-329.

Tests of plasticity of individual crystals and mathematical data on various types of deformation. The Bauschinger effect permits study of consolidated stresses.

4-141. Grain Boundaries in Metals. *Engineer*, v. 184, Aug. 29, 1947, p. 196-197.

Discusses and reviews six papers on the above subject, from Rosenhain and Erven's 1912 presentation to Ting-Sui Ke's recent article in *Physical Review*.

4-142. Diffraction of X-Rays by the Alloy AuCu$_3$. *Nature*, v. 160, Aug. 30, 1947, p. 403.

I. G. Edmunds, R. M. Hinde, and H. Lipson present results obtained by taking X-ray oscillation photographs of a single crystal, and discuss them in terms of published theories. A. J. C. Wilson develops a mathematical expression which accounts qualitatively for the results presented by Edmunds, Hinde, and Wilson, and also for those of other investigators.

4-143. The Adsorption of Hydrogen on Tungsten Powders. George Halsey and Hugh S. Taylor. *Journal of Chemical Physics*, v. 15, Sept. 1947, p. 624-630.

An analysis of the data of Frankenburg on the adsorption of hydrogen by metallic tungsten powder between −194° and 750° C. It was possible to interpret the data only on the basis of a nonuniform surface without interaction.

4-144. Etat Actuel de Nos Connaissances sur les Points Durs Dans Les Alliages Légers. Aspects, Composition, Causes. (Present Status of Knowledge of Hard Spots in Light Alloys. Aspects, Compositions, Causes.) Marcel Bardot. *Fonerie*, June 18, 1947, p. 684-691.

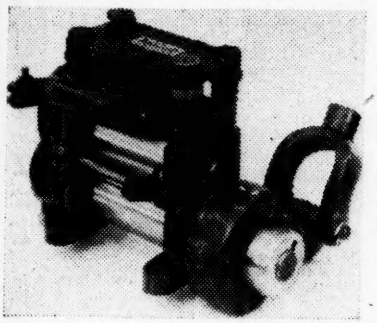
A summary based on literature in English and German. Concludes that most hard spots are due to the formation of corundum or spinel.

4-145. Modifications of Aluminum-Germanium Alloys. E. A. Boom. *Bulletin of the Academy of Sciences of the U.S.S.R., Section of Chemical Sciences*, May-June 1947, p. 317-318. (In Russian.)

The effect of additions of sodium on the structure of Al-Ge alloys. Results

(Turn to page 18)

For feeding stock into punch presses from coils or strips, La Bahn Machine & Mfg. Co. (R-982) is making the La Bahn automatic roll feed. Simplicity of design and operation is a characteristic of the device. The rolls turn only when the stock is being fed into the press and, at the end of the forward movement, the rolls are separated by a lifter actuated by the ram of the press.



La Bahn Automatic Roll Feed

Denison Engineering's new six-station index table (R-983) can be used with any equipment where hydraulic power is available; it works directly off the hydraulic system of the press with which it is being used. Action of the table and press is completely automatic. The ram cannot descend while the table is in motion and the table will not rotate until the ram has completed its cycle. The dial of the index table is actuated by a Denison Hydroilic fluid motor equipped with speed control regulation for 10 to 70 indexes per min.

For feeding larger presses (either inclined or horizontal bed type) Lyon-Raymond Corp. (R-984) now offers a tilting-type hydraulic strip and sheet feeding table. It can be had in 2000 lb. capacity with table widths from 12 to 24 in. and lengths up to 96 in. (including the removable extensions). From a flat position the table top may be adjusted to a 30° tilt with several intermediate positions.

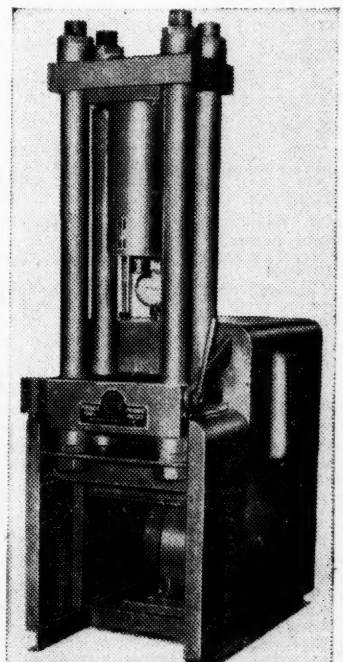
Use of a variable speed control on a high-speed automatic press enables the operator to start the machine at a comparatively slow speed and gradually increase it while the machine is running until the machine reaches its maximum efficiency. For this purpose Reeves Pulley Co. (R-985) manufactures Vari-Speed motor pulleys. Two such pulleys installed on a high-speed automatic press manufactured by Ace Tool and Die Works, for example, give an infinite variable speed range from 150 to 600 r.p.m. One of the pulleys is mounted on the motor which is bolted to the base of the machine frame. It drives to a 4¾-in. diameter pulley on a movable countershaft. On the other end of the countershaft is mounted the second pulley which drives to an 11¾-in. diameter flywheel. This arrangement will give approximately a 5:1 speed variation.

Pelleting and Fine Metal Presses

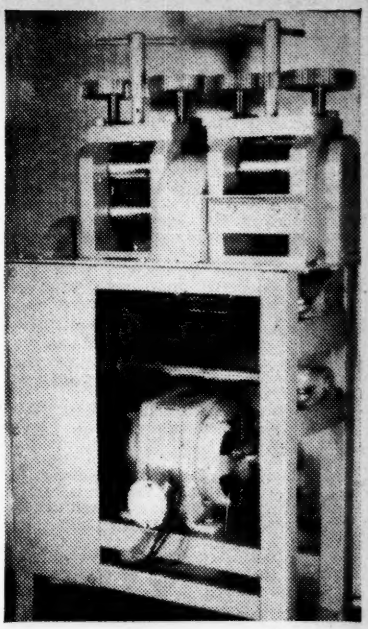
A new machine and technique in which tablet compressing is done under vacuum has been developed by F. J. Stokes Machine Co. (R-986) and is being investigated for its application to metal powders and sintered carbides. The press applies a maximum of 20 tons pressure from above and below, has a die fill of 2⅝ in. and will deliver pieces up to 3 in. diameter. A vacuum chamber surrounds the die table, the punches and the feeding device. The feed hopper, with vacuum cover, is attached to the top of the vacuum chamber and a receptacle underneath receives the finished parts at the side of the main vacuum chamber. Special stuffing boxes seal the upper and lower plungers where they enter the chamber. Elimination of air produces denser and heavier parts.

A further addition to Denison Engineering Co.'s Multipress is an automatic pelleting press based on Denison's "vibratory control" principle (R-987). Repeat strokes of the ram during compacting expel the air more completely from the die, resulting in higher density, better distribution of material and edge finish on the compact. Vibrating the charging box fills the die more evenly and avoids arching and hold-up of powder in the hopper.

A 160-ton two-platen embossing press is designated as Model No. E-160 by its manufacturer, Rodgers Hydraulic, Inc. (R-988). Pressure is supplied by a two-cylinder hydraulic pump, with a ram speed of 14 in. per min. This press may also be used for hobbing steel cavities for reproduction dies. An embossing press of 250 tons capacity is also available.



Rodgers Embossing Press



Thor Rolling Mill

A new Thor combination power rolling mill, while designed particularly for jewelers and chain makers, has many applications in the fine metal field. Main feature of these mills, which are distributed by Alexander Saunders & Co. (R-989), is solid steel housings (replacing cast iron). The Model 47A may be used for flat work or for rolling square wire. Crucible steel rolls, precision ground and mirror-finished, are 3 in. diameter by 5 in. long. Wire rolls have 16 square grooves for wire from 0.050 to ⅜ in. square.

Addresses of Manufacturers

Agnew Electric Co. (R-955)
Milford, Mich.

Air-Hydraulics, Inc. (R-978, 979)
401 Broadway
New York 13, N. Y.

Ampco Metal, Inc. (R-940)
1745 South 38th St.
Milwaukee 4, Wis.

Benchmaster Mfg. Co. (R-981)
2952 West Pico Blvd.
Los Angeles 6, Calif.

Chambersburg Engineering Co.
Chambersburg, Pa. (R-951, 952, 969)

Chêston Co., Frank C. (R-954)
38 Park Row
New York 7, N. Y.

Coast Metals, Inc. (R-946)
1232 Camden Ave., S. W.
Canton 6, Ohio

Colonial Broach Co. (R-977)
Box 37, Harper Station
Detroit 13, Mich.

(Turn to page 53)

are comparable to the effects observed in Al-Si alloys.

4-146. Dependence of Structural Degree of Order of Cu-Au Alloys on Temperature and Concentration. A. Komar and N. Buinov. *Journal of Experimental and Theoretical Physics*, v. 17, June 1947, p. 555-563. (In Russian.)

A relationship is established connecting the relative intensity of the lines in Debye patterns with the "degree of order" of the atomic structure as described by Bragg and Williams, for gold-copper alloys containing 18.9 to 33.9 atomic percent gold. The data indicate better agreement with the theory of Peirls than with that of Bragg and Williams. 20 ref.

4-147. The Effect of Cobalt on the Rate of Nucleation and the Rate of Growth of Pearlite. Malcolm F. Hawkes and Robert F. Mehl. *Metals Technology*, v. 14, Aug. 1947, T.P. 2211, 26 p.

Results of experiments show that cobalt increases both of the above processes and that this effect is inherent in the Fe-Co-C system and not dependent upon factors relating to austenite heterogeneity nor upon any recognizable adventitious factor. Other factors covered include: effect of cobalt on hardenability; effect of cobalt on coefficient of diffusion of carbon in austenite; rate of diffusion of cobalt in austenite; effect of nitrogen on the rate of transformation of cobalt steels; and effect of cobalt on the martensite temperature range. 34 ref. (Presented at New York Meeting of A.I.M.E., March 1947.)

4-148. The Diffusion Rates for Carbon in Austenite. F. E. Harris. *Metals Technology*, v. 14, Aug. 1947, T.P. 2216, 22 p.

The steady state and unsteady flow under definite restrictions. Beginning with the fundamental concept, the development is continued until equations are obtained. Results are then compared with experimental data. Rigorous proof is not claimed. Instead an attempt is made to set forth the physical significance of the diffusion mechanism, and particularly to express the factors which influence the flow of carbon in austenite. Also indicates that gaseous media may be used with reasonable accuracy in making the determinations. (Presented at New York Meeting of A.I.M.E., March 1947.)

4-149. Graphite Formation in Gray Cast Iron. H. Morrogh and W. J. Williams. *Foundry Trade Journal*, v. 82, Aug. 21, 1947, p. 359-363; Aug. 28, 1947, p. 391-396; Sept. 4, 1947, p. 6-12.

See abstract of condensation which appeared in *Engineering*, Aug. 8 and Aug. 15, 1947. (Item 4-127.)

4-150. An X-Ray Diffraction Study of the Silver-Magnesium Alloy System. Harold R. Letner and S. S. Sidhu. *Journal of Applied Physics*, v. 18, Sept. 1947, p. 833-837.

Investigation by X-ray photograms showed four homogeneous solid solutions in the Ag-Mg system. 18 ref.

4-151. Andrade's Creep Law and the Flow of Zinc Crystals. A. H. Cottrell and V. Ayterkin. *Nature*, v. 160, Sept. 6, 1947, p. 328-329.

Several modifications have been made in Andrade's law in order to extend the results to single crystals. Zinc crystals, in the form of wires, were examined and results calculated.

4-152. A Dynamical Model of a Crystal Structure. Lawrence Bragg and J. F. Nye. *Proceedings of the Royal Society (Series A)*, v. 190, Sept. 9, 1947, p. 474-481.

The crystal structure of a metal is represented by an assemblage of bubbles floating on the surface of a soap solution. The assemblages show structures which have been supposed to exist in metals, and simulate effects which have been observed, such as grain boundaries, dislocations and other types of fault, slip, recrystallization, annealing, and strains due to foreign atoms.

4-153. Grain Boundaries. *Metal Industry*, v. 71, Sept. 19, 1947, p. 246.

Three recent papers on the amorphous-phase theory.

4-154. Effect of Heat Treating and Cold Rolling on Crystal Structure of Austenitic Manganese Steel. N. P. Goss. *Steel*, v. 121, Sept. 29, 1947, p. 74-75, 117-118, 120; Oct. 6, 1947, p. 98-100, 132, 135, 138, 141-143.

The X-ray diffraction method for following alterations in grain structure beyond the microscope's range. The mosaic theory of subboundary structure is used to explain changes taking place in heat treated Hadfield steels. Results reported in final part indicate that delayed quenching may actually improve the capacity for plastic deformation by cold working.

4-155. Quelques Remarques Pratiques Sur Les Gaz Dans L'Acier et la Fonte. (Some Practical Remarks on Gases in Steel and Cast Iron.) Eugène Eyt. *Fonderie*, July 1947, p. 713-720.

Factors which cause gas absorption in steel and cast iron, emphasizing viscosity and surface tension of the metal. A hypothesis for the stabilization of gases by precipitation of oxides formed during deoxidation.

4-156. Determination of the Crystal Structure of Gold Leaf by Electron Diffraction. T. B. Rymer and C. C. Butler. *Proceedings of the Physical Society*, v. 59, July 1, 1947, p. 541-554.

Radii of the rings of Debye-Scherrer electron-diffraction photographs obtained from gold leaf are not in exact agreement with theoretical values. This is ascribed to distortion of the crystal lattice by surface-tension forces.

4-157. The Hole Theory of Diffusion. G. Wyllie. *Proceedings of the Physical Society*, v. 59, July 1, 1947, p. 694-699.

A mechanism for diffusion in a dilute substitutional solid solution of one metal in another explains cases where diffusion of a foreign metal atom in a lattice has a lower activation energy than self-diffusion in the same lattice, gold in lead being a conspicuous example.

4-158. The Isothermal Transformation of a Eutectoid Aluminum Bronze. David J. Mack. *Metals Technology*, v. 14, Sept. 1947, T.P. 2242, 16 p.

The material used was a high-purity aluminum bronze containing 88.07% Cu, 11.89% Al, 0.02% Fe and 0.01% Mn. 34 ref.

4-159. Some Observations of Lineage in Copper Crystals. Walter R. Hibbard, Jr. *Metals Technology*, v. 14, Sept. 1947, T.P. 2244, 6 p.

Lineage denotes dendritic branches, grown from a crystal nucleus during solidification from the liquid, with imperfections in alignment of the order of 10^{-3} to 10^{-4} cm. Results of metallographic, X-ray, and property studies of lineage in large grain and single crystal specimens of copper. 15 ref.

4-160. Grain Growth in High-Purity Aluminum and in an Aluminum-Magnesium Alloy. Paul A. Beck, L. J. Demer, Joseph C. Kremer, and M. L. Holzworth. *Metals Technology*, v. 14, Sept. 1947, T.P. 2280, 23 p.

Results of an investigation of isothermal grain growth in rolled strips of high-purity aluminum and of a high-purity Al alloy containing 2.1% Mg, at a series of temperatures. Effects of annealing time and temperature, different amounts of cold work, and of the Mg addition. 13 ref.

4-161. Austenite Transformation Above and Within the Martensite Range. Robert T. Howard, Jr., and Morris Cohen. *Metals Technology*, v. 14, Sept. 1947, T.P. 2283, 13 p.

The purpose of this paper is to direct attention to the lower part of the austenite transformation diagram where considerable uncertainty still exists as to the blending of the bainite and martensite reactions. The transformation was studied quantitatively by lineal analysis in a series of five high-carbon and nickel steels. A single empirical equation has been fitted to the five curves. 15 ref.

4-162. The Alloys of Magnesium and Cobalt. E. M. Cramer, H. P. Nielsen, and F. W. Schonfeld. *Light Metal Age*, v. 6, Sept. 1947, p. 6-9.

Results of experimental work on the low-cobalt portion of the phase diagram, obtained by thermal, microscopic, X-ray, and physical-examination methods.

4-163. Growth of Stimulated Crystals and Rate of Nucleation During Recrystallization of Aluminum. W. G. Burgers. *Nature*, v. 160, Sept. 20, 1947, p. 398-399.

Dependence of the above quantities on the time of recrystallization at constant temperature.

4-164. The Role of the Constituents of Coke in Graphite Formation. V. N. Krylov. *Journal of Applied Chemistry (U.S.S.R.)*, v. 20, no. 3, 1947, p. 239-244. (In Russian.)

Results of a study of the effect of the metallic constituents of coke on the structure and properties of graphite electrodes produced from it. Elimination of iron is necessary because it has a high boiling point and therefore remains in the graphite and forms alloys with aluminum and silicon. This hinders the electrochemical separation of the latter.

4-165. Reactions in the System SiO_2-C at Elevated Temperatures. A. N. Novikov. *Journal of Applied Chemistry (U.S.S.R.)*, v. 20, May 1947, p. 431-438. (In Russian.)

The mechanism of the above reactions and the probability of their occurrence at different temperatures. 11 ref.

4-166. The Motion of an Electron in the Lattice of an Alloy of Arbitrary Composition. A. A. Smirnov. *Journal of Experimental and Theoretical Physics (U.S.S.R.)*, v. 17, Aug. 1947, p. 730-742. (In Russian.)

Attacks the above problem after considering electron behavior in the lattice of a fully ordered alloy from the point of view of quantum mechanics. Determines the influence of composition and of long-range order on the energy spectrum of the electron.

4-167. Theory of Electroconductivity of Ordered Alloys. A. A. Smirnov. *Journal of Experimental and Theoretical Physics (U.S.S.R.)*, v. 17, Aug. 1947, p. 743-752. (In Russian.)

How electrical conductivity of an alloy is influenced by composition and by long-range order in the distribution of atoms. Experimental data with the resulting formula for residual electrical conductivity in ordered binary alloys. 12 ref.

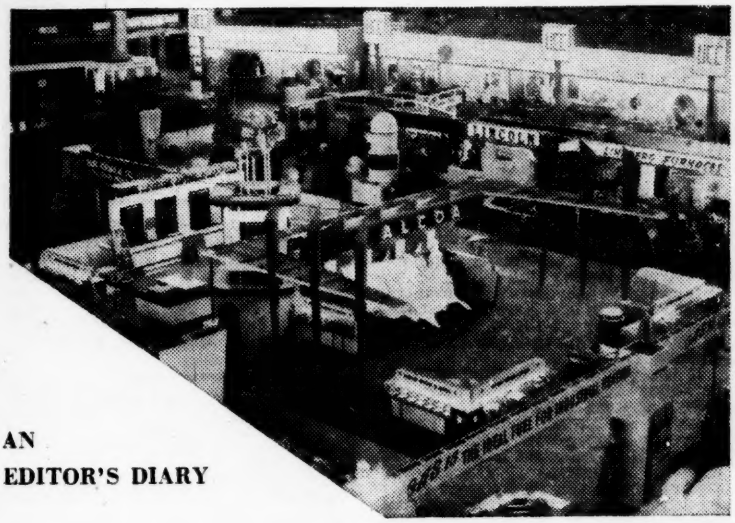
4-168. Long-Range Order in Au-Cu Alloys and Their Electroconductivity. A. P. Komar. *Journal of Experimental and Theoretical Physics (U.S.S.R.)*, v. 17, Aug. 1947, p. 753-756. (In Russian.)

An experimental relationship between the specific electrical resistance of alloys of approximate composition $AuCu_3$ and $AuCu$, and the degree of long-range order of the atoms. This relation agrees well with the quantum-mechanical theory of Smirnov-Ryzhanov, but the corresponding theory of Muto is not confirmed by experiment. 17 ref.

4-169. On the Equilibrium and Kinetics of Order-Disorder Transformations in Alloys. G. Borelius. *Journal of the*

(Turn to page 20)

Seven Days at the Metal Congress



AN EDITOR'S DIARY

Saturday, Oct. 18—Opening at 12:00 noon amidst a last-minute bustle of whisking away remaining crates and sweeping up the final traces of sawdust and excelsior, the 29th National Metal Exposition in Chicago's International Amphitheatre brought to this unlovely stockyards district a contrasting scene of colorful display and vigorous activity. Layout of the seven acres of exhibits in five separate halls, while contributing to the confusion of registration, permitted the visitor with plenty of time to plan a systematic tour without being immediately overwhelmed with the immensity of the undertaking.

Signs reading "new and revolutionary" cropped up with astonishing frequency; operating equipment was larger and more intricate than ever; eye and interest-catching devices and gadgets were only supplementary to the real interest evidenced in the displays. The whole impression was of a "shirt-sleeve show" with emphasis on the working tools of the industry rather than on decoration and eye appeal.

The two-story main arena holding only 30 of the most spacious exhibits was flanked on both sides by large halls, each with 75 to 100 booths—halls that were duplicated on the second floor behind the arena balconies to make a grand total of 406 exhibitors—the largest number in the history of the Metal Show.

First order of business at the Exposition, even before the doors opened, was the judging of the A.S.M. Metallographic Exhibit, a display of 219 superb micrographs. First prizes and honorable mentions were awarded in 11 classifications; names of the award winners are listed on page 25.

Subzero transformation of austenite was the subject of the print that won grand prize for best in show. Although not so spectacular as some of the beautiful color prints and electron micrographs, it was chosen, according to the judging committee, on the basis that it represented work that could be done in any laboratory with ordinary equipment; not only was the micrography of highest order, but the difficulty of the subject was also a contributing factor in the decision. Honorable mentions awarded to an entry from France, one from Sweden and one from Australia lent a distinct international flavor to the exhibit.

Sunday, Oct. 19—Among the technical programs another early event was the two-day meeting on "Fundamental Relationships in the Fracturing of Metals" sponsored by A.S.M. in conjunction with Case Institute of Technology. This program was a source of wonderment to the ordinary garden variety of metallurgist (and a despair to the press reporters). How some 250 scientists could sit through 12 hours a day, morning, afternoon and evening, for two solid days (and a glorious Indian summer week-end at that) to listen to the most complex kind of physico-mathematical metallurgy is but another attestation to the researcher's insatiable hunger for knowledge.

Back at the Exposition, one of the focal spots, occupying nearly a third of the main arena (and balancing at the other end the beautifully appointed and tastefully arranged booths of Ohio Crankshaft, International Nickel, and Union Carbide), was the Combined Industrial Gas Exhibit sponsored by the American Gas Association and 12 of its associated companies. High-speed gas heating was exemplified in Selas Corp.'s operating model of bar and tube annealing furnaces in a production line. Bars are carried on rollers through a series of drum-shaped heating units; temperature is regulated by speed of travel through the furnaces, and any desired production speed can be obtained by varying the number of furnaces in the line.*

Raising the carbon content of strip uniformly through its entire thickness from 0.05 to 0.40% C is one of the accomplishments of Surface Combustion Corp. known as homogeneous carburizing. Surface RX gas, which can be controlled by means of its dew point to give the correct balanced carbon potential, is the carburizing atmosphere. Parts of varying thickness can be processed as easily as those of uniform thickness.

In conjunction with its dew point recorder Surface Combustion also showed a gas switching manifold which permits one recorder to test gas from six different sources. A six-way valve, motor and a time clock are so arranged that after a preset time the line which is feeding the dew point recorder will automatically switch to the next line. The five lines which are not being tested will be purging continuously.

In the Lithium Co.'s section of the Gas Exhibit, an attendant told how lithium atmospheres are now being used for preheating billets for forging. Hot gases pass over a stick of metallic lithium, and enough of this vaporizes to remove all moisture and also deposit a thin film of lithium on the metal's surface, preventing any formation of scale either in the furnace or en route to the forging hammer. Such scale-free billets reduce scour on the dies to a minimum, and die life is thereby increased many times.

Monday, Oct. 20—One of the most spectacular products to make its first public appearance at a Metal Show was the Cincinnati Milling Flamatic hardening machine. The one on exhibit was in actual production hardening starter ring gears for Springfield Mfg. Co. and turning out about 800 gears per day. (Actual plant production is 250 per hr.) Other than give detailed explanations to the large and curious crowds surrounding the machine, the operator's only duty was to place the gear in the fixture and push a button. The gear spins, four flame heads explode into 6200° F. heat, roar for a few seconds, shut off, and the gear drops

(Turn to page 21)

*Detailed descriptions of equipment mentioned only briefly in these paragraphs will be carried in future issues of *Metals Review* in special articles devoted to specific branches of the metal industry.

Institute of Metals, v. 74, Sept. 1947, p. 17-31.

The above equilibrium as a first approximation, by formulas giving the structural parts of internal energy and entropy as functions of a suitable measure of the degree of disorder. As a second approximation, the influence of fluctuations is taken into account. The calculations are compared with experimental results of measurements on CuZn. The kinetics of the transformations are described in a range on both sides of the critical point, the rate of transformation is influenced by a thermodynamic potential barrier which is theoretically described on the basis of the fluctuation theory, and the calculations are compared with results of X-ray measurements on AuCu. 18 ref.

4-170. The Constitution of Alloys of Aluminum With Copper and Manganese. M. K. B. Day and H. W. L. Phillips. *Journal of the Institute of Metals*, v. 74, Sept. 1947, p. 33-54.

The constitution of alloys of Al-Cu-Mn, slowly cooled, was studied in detail by thermal and microscopic methods over the range 0 to 18% Cu and 0 to 8% Mn. 33 ref.

4-171. Behavior of a Chromium Steel in the Jominy Hardenability Test. W. I. Pumphrey. *Journal of the Iron and Steel Institute*, v. 157, Sept. 1947, p. 27-30.

Metallurgical examination, including examination by the electron microscope of the structures developed along the length of a Jominy bar of a steel possessing unusual hardenability characteristics at certain slow rates of cooling indicates that the structures can be explained on the basis of a derived S-curve which is not abnormal in type.

4-172. A Micro-Examination of Eight Steels for the Inclusions Sub-Committee. J. H. Whiteley. *Journal of the Iron and Steel Institute*, v. 157, Sept. 1947, p. 89-97.

An investigation of the number, distribution and nature of inclusions in a series of eight low-alloy steels. Full details of the counting procedure. Results indicate a direct relationship between the number of inclusions and combined sulphur and oxygen contents. Microstructures.

4-173. Unsolved Problems of Structural Chemistry. Linus Pauling. *Chemical and Engineering News*, v. 25, Oct. 13, 1947, p. 2970-2973, 3045.

In surveying the progress of the past 25 years it sometimes appears that the major problems in structural chemistry have been solved. Despite this, author points out a large number of unsolved problems in diverse fields, including that of the structure of metals and intermetallic compounds. 12 ref.

4-174. Study of a High Speed Steel Ingot. Charles F. Sawyer, Jr. *Iron Age*, v. 160, Oct. 16, 1947, p. 140-142.

Results of a structural analysis, conducted by the technique of ingot splitting, coupled with chemical analysis which reveals some interesting ingot characteristics. Data of a quantitative nature relating to alloy segregation in a normal production ingot of 18-4-1 high speed steel.

For additional annotations indexed in other sections, see:
2-240; **5**-71; **11**-149-150; **18**-211-213; **19**-334-335; **20**-575; **24**-318; **27**-226.

136 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

5 POWDER METALLURGY

5-64. Introduction to Seminar—Review of Literature on Pressing of Metal Powders. Richard Paul Seelig. *Metals Tehnology*, v. 14, Aug. 1947, 29 p.; discussion, p. 13-29.

Operations which occur between the time the powder is filled into the cavity and the compact is ejected from the die. Does not concern hot pressing, coining or sizing feed, flow problems, commercial presses, or designs. 65 ref. (Presented at New York Meeting of A.I.M.E., March 1947.)

5-65. The Losses in Carbon, Sulphur and Oxygen During the Sintering of Iron Powders in a Hydrogen Atmosphere. Gustav F. Huttig and Karl Sedlatschek. *Powder Metallurgy Bulletin*, v. 2, Sept. 1947, p. 80-84. (Translated from the German.)

It was found that heating at temperatures below 500° C. lowers the oxygen content without markedly decreasing the carbon content. Therefore, low-temperature reduction will not result in complete elimination of oxygen. A sintered steel practically free of oxygen can be produced either by using a powder mixture which contains considerably more carbon than required in the finished product, or by processing in a sintering atmosphere containing CO or hydrocarbons. Effects of addition of chlorides to the powder, or of chlorine compounds to the sintering atmosphere.

5-66. Electrolytic Copper Powder. *Metal Industry*, v. 71, Sept. 12, 1947, p. 226-227.

Production methods employed by German technicians. (Abstracted from a B.I.O.S. report.)

5-67. Precision Powder Spreader and Other Highlights of Bearing Strip Process. *Automotive Industries*, v. 97, Oct. 1, 1947, p. 46, 78, 82.

Procedures and equipment for production of copper-lead sintered metal-powder bearing at Greenville Mich., plant of Federal-Mogul Corp. Unique device for spreading copper powder over steel strip so as to produce a parallel top surface and uniformity of layer thickness to a tolerance of 0.001 in.

5-68. The Manufacture of Copper-Lead Bearings From Metal Powder. E. R. Darby. *Canadian Metals & Metallurgical Industries*, v. 10, Sept. 1947, p. 21-22.

Process developed by Federal-Mogul Corp., Detroit.

5-69. Pressed and Sintered Iron Powders. W. Rostoker. *Canadian Institute of Mining and Metallurgy Transactions* (bound with *Canadian Mining and Metallurgical Bulletin*), v. 50, Sept. 1947, p. 497-508.

Results of a study of the effect of particle-size distribution on their physical properties.

5-70. Impact of Industrial Revolution on Powder Metallurgy. Joseph E. Drapeau, Jr. *Metal Progress*, v. 52, Oct. 1947, p. 606-608.

Development of powder metallurgy and its applications.

5-71. Sinteralumina. Part I. Felix Singer and Hans Thurnauer. *Metallurgia*, v. 36, Sept. 1947, p. 237-242.

Investigations on sintered alumina and the main factors which affect the usefulness of this material. Particular attention to the chemistry of reactions in the solid phase and to the orientation, growth, and general characteristics of the crystallites in sintered alumina in particular. 18 ref. (To be continued.)

For additional annotations indexed in other sections, see:
2-241; **3**-313; **4**-143; **11**-157; **15**-34; 18-206; **27**-230.

78 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

6 CORROSION

6-246. The Prevention of Metallic Corrosion. G. Fitzgerald-Lee. *Aeroplane*, v. 78, Aug. 29, 1947, p. 251-252, 253.

Review of the various methods.

6-247. Cathodic Protection of Underground Systems. Joe Frink. *American Gas Journal*, v. 167, Sept. 1947, p. 27-29.

Principles and techniques.

6-248. Sulphur Dioxide Versus Construction Materials. *Chemical Engineering*, v. 54, Sept. 1947, p. 209-210.

Final part of symposium, Haveg described by E. P. Mampe; lead by H. M. Church, Jr.; and tantalum by Frederick L. Hunter.

6-249. Selective Corrosion of Phosphor Bronze. W. D. Clark. *Engineering*, v. 164, Aug. 29, 1947, p. 214-216.

A metallographic study of all the available pump impellers which had been in service in the feed-water system of a power station in order to determine the nature and cause of corrosion leading to failure. Concluded that attack is by selective solution analogous to dezincification and that solution and redeposition are almost certainly involved. (Condensed from "A Note on the Selective Corrosion of Phosphor Bronze in Hot-Water Service," presented to Institute of Metals, March 6, 1947.)

6-250. Corrosion in Condensate Return Lines Studied. (Concluded.) John F. Collins, Jr. *Heating, Piping & Air Conditioning*, v. 19, Sept. 1947, p. 108-110.

Secretary-Treasurer completes report of 38th annual meeting of National District Heating Association.

6-251. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 39, Sept. 1947, p. 103A-104A.

Recent work at Ohio State University indicates that 18-8S stainless steel becomes passive because of a physically adsorbed gas. This process is reversible in that the alloy can be passivated, broken down, repassivated, broken down, and so on, by alternate exposure to air and vacuum.

6-252. Corrosion Data: Melamine-Formaldehyde Resin and Dilute Hydrochloric Acid. *Clad News*, v. 8, no. 2, p. 7.

Results of corrosion tests in mixture of melamine-formaldehyde resin and dilute hydrochloric acid, on monel, nickel, Inconel, Ni-Resist (Type I), and mild steel. Solution is added to

(Turn to page 22)

into an oil quench and onto a conveyer belt. Exact temperature control by radiation pyrometer is the key to the machine's precision.

A reverse-flow recirculating furnace roused much interest at the booth occupied by Sunbeam Stewart Industrial Furnace Division. A damper arrangement at the fan outlet reverses the flow of gases through the work at regular intervals, permitting closer temperature control and faster and more uniform heating. (See article in October *Metal Progress*, page 594.)

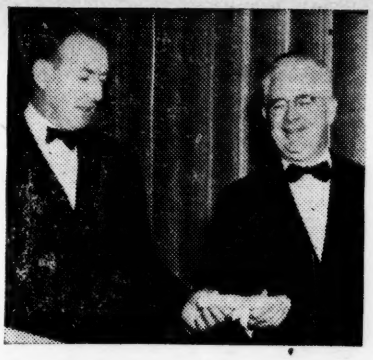
Giant aluminum watch chains draped across several vests seen in the Amphitheatre emanated from the Lindberg booth where the new Lindberg-Fisher induction melting furnace was busy turning them out in continuous lengths. Continuity of operation is provided by two chambers, one for melting and one for pouring—cold metal additions do not affect the temperature in the pouring chamber.

Tuesday, Oct. 21—Back at the Palmer House, crowds stormed the ballroom each morning for A.S.M. technical sessions made comfortable by air conditioning, public address system and other properly functioning equipment. Interest ran high in technical papers on transformation of austenite —(an observation corroborated by a visitor at an A.I.M.E. meeting on the same subject), with Fletcher, Averbach and Cohen drawing an attentive audience for two papers describing further progress in their research on "Dimensional Stability of Steel".

Experimenting with subzero cooling, they found that if the amount of retained austenite in toolsteels is low, virtually all of it can be transformed by immediate refrigeration after quenching. However, if the retained austenite is high, only a fraction is transformed on refrigeration. The second paper described investigations on room temperature decomposition of martensite and austenite, during the course of which the authors derived an equation fitted to the basic reaction curve so that it is possible to predict the course of martensite shrinkage at room temperature after any given preshrinkage by tempering.

Lack of air conditioning in the beautifully appointed meeting room at the Saddle and Sirloin Club did not deter equally large groups of perspiring but knowledge-seeking visitors from attending afternoon sessions and lecture courses on the International Amphitheatre grounds. Even more than the usual professorial skill was exhibited by Cornell's C. W. Mason (and was vastly appreciated by his audience) in compressing the fundamentals of physical metallurgy into four high-powered lectures.

Wednesday, Oct. 22—The continued health and success of the American Society for Metals from both an educational and a business standpoint was mirrored in the officers' reports presented at the Society's annual meeting. Diversity of A.S.M. membership was stressed by President Boegehold, who read figures breaking down the 20,000 members into classifications by company position; and concluded that the Society offers educational advantages to a wide variety of occupations dealing with metals. The largest group in the Society's membership is the metallurgist (29.43%), corporate officials and plant personnel account for 20.15%, and engineering personnel for 12.10%. The remaining 38% ranges from purchasing and sales to educational institutions and libraries.



President Boegehold Presents a Certificate Commemorating 10 Years' Continuous Service as Secretary of the Columbus Chapter to Ernie Christin (Right) of Columbus Bolt Works

Educational activity was reflected in the addition of seven new titles during the past year to the books published by the Society. Total distribution of books for the year was 17,711 copies, exclusive of the *Transactions*.

In addition to the reports of the president, secretary, and treasurer, Vice-President Foley presented a resolution for approval at the annual meeting, which had the effect of changing the articles of incorporation of the Society so that the board of trustees would be privileged (should they so desire) to make arrangements for various additional facilities which would enable the A.S.M. to disseminate educational information on various engineering subjects and assist in accomplishing the purposes for which the Society was incorporated.

The resolution, as presented and recommended by the unanimous vote of the board of trustees, was adopted. The present article of incorporation, with the new portion printed in italics, is as follows:

Said corporation is formed for the purpose of advancing scientific and technical knowledge, particularly with respect to the manufacture, use and treatment of metals, through research, education, and the dissemination of information for the benefit of the general public. It shall have power to acquire, hold, invest, reinvest, and dispose of real and personal property exclusively for such purpose. *For the accomplishment of such purpose, it shall have power to own, control and operate facilities of every kind and nature for disseminating knowledge and information to the general public, including facilities for broadcasting by radio, facsimile, radio-telegraph, television and similar processes, and shall have power to engage in all activities necessary or appropriate to the ownership, control and operation of such facilities.* No part of the net earnings of the corporation shall inure to the benefit of any private shareholder or individual, and no part of its activities shall consist of carrying on propaganda, or otherwise attempting, to influence legislation. In the event of the dissolution of the corporation, the board of trustees shall dispose of its net assets, in trust, however, to further its purpose as above stated, without preference in favor of any member, officer, or trustee, upon such terms and conditions as the board of trustees shall determine.

Additional comers filtered in all through the meeting until even standing room was at a premium by the time A. B. Kinzel took the rostrum to deliver the Campbell Memorial Lecture. And well worth standing it was, the reward taking the form of a clear, colorful, extemporaneous presentation in an orderly and understandable manner. An immense amount of research lay beneath the comparatively few well-chosen words used to describe the derivation of a test for determining the suitability of a steel for structural welding. A condensed version of the lecture appears in the November issue of *Metal Progress*, and it will be published in full in *Transactions*.

A second notable exposition of highly technical data occurred later that day at a special A.S.M. evening meeting on atomic energy, with Clyde Williams, president of the American Institute of Mining and Metallurgical Engineers, as chairman. To open the program M.I.T.'s John Chipman artfully compressed the metallurgy of uranium, plutonium and beryllium into an instructive three-quarters of an hour. Walter H. Zinn, director of the Argonne National Laboratory of the U. S. Atomic Energy Committee, took up where Dr. Chipman left off, and demonstrated some of the varied uses to which a nuclear chain reactor can be put. Reducing mathematical formulas and equations to their simplest forms, he was able to make almost understandable the method by which a uranium pile can be used for determination of corrosion, for manufacture of radioactive isotopes, for increasing magnetic saturation, and for determining the proper thickness of various alloys for cooling pipes in the pile.

Thursday, Oct. 23—A spectacular underwater cutting and welding booth at one end of the long space occupied by the Navy's Bureau of Ships was balanced on the other end by an

(Turn to page 23)

pulp in a process for improving the wet strength of paper.

6-253. Potentials of Some of the Industrial Metals in Organic Acids. V. D. Iakhontov. *Journal of General Chemistry (U.S.S.R.)*, v. 17 (79), April 1947, p. 635-641. (In Russian.)

Potentials of the common metals were measured in monobasic and dibasic acids and in oxy-acids. The arrangement of metals in the order of the values of their potentials in the organic acids is identical to the classical series with a few exceptions. The observed data are correlated on a theoretical basis. The method may aid in determining the tendencies of metals to react with acids.

6-254. The Accuracy of Corrosion Tests Using Improved Apparatus. A. S. Afanas'ev, V. K. Rostovtseva, and M. G. Burakova. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 847-850. (In Russian.)

Results of a statistical analysis of gravimetric data obtained using the improved apparatus previously described by the first two authors for atmospheric corrosion testing. Considerable improvement in accuracy and reducibility of results is achieved.

6-255. Gamma Ray Detection of Internal Corrosion. Leroy R. Keller. *Petroleum Engineer*, v. 18, Sept. 1947, p. 211-214.

Principles and operation of the Penetron, developed by Texaco Development Corp.

6-256. Zur Kenntnis Elektrolytisch Erzeugter Oxydschichten auf Aluminium. (Concerning Electrodeposited Oxide Layers on Aluminum.) Fritz Liechti and W. D. Treadwell. *Helvetica Chimica Acta*, v. 30, no. 5, 1947, p. 1204-1218.

The growth and analytical content of oxide films on aluminum during anodic oxidation in sulphuric and oxalic acid solutions, respectively, with and without bath agitation. Equation is deduced from the curves for the film from the sulphuric acid bath which shows that the sulphate-ion content of the film decreases exponentially with its thickness. In oxalic acid, no appreciable solution of the film takes place.

6-257. La Corrosion Intercristalline de L'Aluminium de Haute Pureté et ses Conséquences au Sujet de la Nature des Joints de Grains. (Intercrystalline Corrosion of High-Purity Aluminum and Its Effects on the Nature of Grain Boundaries.) Paul Lacombe and Nicolas Yannaquis. *Metaux et Corrosion*, v. 22, March 1947, p. 35-37.

Electropolished specimens of pure aluminum sheet are subjected to prolonged attack by 10% HCl. Specimens are attacked along grain boundaries, although resistance to attack is shown in some cases.

6-258. Use of Magnesium, Zinc, Aluminum and Their Alloys in the Cathodic Protection of Steel in Salt Water. R. R. Rogers and C. E. Viens. *Canadian Metals & Metallurgical Industries*, v. 10, Sept. 1947, p. 16-18, 36, 38.

Results of experimental work done in order to find the best way to protect steel piling from salt-water corrosion. Work consisted of three series of tests—with cylindrical and with strip cathodes, and with intermittent immersion (to simulate tide action). The aluminum alloys used were the least satisfactory. The other alloys gave encouraging results.

6-259. Rust Preventive Compounds. Howard B. Carpenter. *Iron and Steel Engineer*, v. 24, Sept. 1947, p. 73-78.

Use in the steel mill. (Presented at A.I.S.E. Annual Convention, Cleveland, Oct. 3, 1946.)

6-260. Thin Oxide Films on Aluminum. Earl A. Gulbransen and W. S. Wysong. *Journal of Physical and Colloid Chemistry*, v. 51, Sept. 1947, p. 1087-1103.

Results of a vacuum-microbalance study of the oxidation behavior of aluminum from 200 to 550° C. Results are correlated with observations on the physical and chemical structure of the oxide film. A few electron-microscope observations. 24 ref.

6-261. Thin Oxide Films on Tungsten. E. A. Gulbransen and W. S. Wysong. *Metals Technology*, v. 14, Sept. 1947, T.P. 2224, 17 p.

Results of a microbalance study of the following problems: the oxidation behavior from 25 to 550° C.; the reduction with pure hydrogen; and the volatility of the films. 27 ref.

6-262. Thin Oxide Films on Molybdenum. E. A. Gulbransen and W. S. Wysong. *Metals Technology*, v. 14, Sept. 1947, T.P. 2226, 17 p.

Presents results of a vacuum-microbalance study of the following problems: the oxidation kinetics from 250 to 450° C.; the reduction with pure hydrogen of the oxide films; the volatility of the films; and their vacuum oxidation at high temperatures. 21 ref.

6-263. Passivity in Chromium-Iron Alloys. Adsorbed Iron Films on Chromium. Herbert H. Uhlig. *Metals Technology*, v. 14, Sept. 1947, T.P. 2243, 10 p.

A mechanism based not on physical protection by an oxide or similar compound but on a change in the tendency of surface metal atoms to react chemically. It was shown by electroplating or evaporating iron on a chromium surface and immersing in HNO_3 that iron in contact with chromium is passive at the interface. A residual film of iron always remained on the surface. The amount resistant to HNO_3 was determined by treating with HCl and analyzing for dissolved iron. The results support the electron configuration theory of passivity and account for the properties of iron alloys containing over 12 to 15% Cr (stainless steels). The amount of residual iron increases with time elapsed after deposition and reaction with nitric acid. Study of this effect shows that surface migration is responsible. This suggests a mechanism for the relatively good protection of some very thin metal coatings, especially commercial electrodeposits of chromium on nickel. 14 ref.

6-264. The Effect of Tensile and Compressive Stresses on the Corrosion of an Aluminum Alloy. W. D. Robertson. *Metals Technology*, v. 14, Sept. 1947, T.P. 2281, 5 p.

Results of an investigation of the effect of an applied tensile stress and a corresponding compressive stress on the general and intergranular corrosion of an aluminum alloy (24S). The type of corrosion was found to be independent of the existence or nature of the applied stress. The function of tensile stress is shown to be that of an accelerator only.

6-265. Outdoor Laboratory Provides Information on Effects of Marine Corrosion. *Civil Engineering*, v. 17, Oct. 1947, p. 32-34, 78.

Cooperative laboratory at Kure Beach, N. C.

6-266. Ferric-Ion Corrosion During Acid Cleaning. F. N. Alquist, J. L. Wasco, and H. A. Robinson. *Corrosion*, v. 3, Oct. 1947. p. 482-487.

Type of corrosion occurs during the acid cleaning of equipment containing ferric oxide deposits—corrosion of the parent metal by ferric ions from the iron oxides as they are reduced to ferrous ions. Several ways of reducing or eliminating this type of corrosion. Glyoxal was found most satisfactory in reducing ferric ion before it attacked the metal. (Presented at the Annual Meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6-267. Electrochemical Factors in Underground Corrosion of Lead Cable Sheath. V. J. Albano. *Corrosion*, v. 4, Oct. 1947, p. 488-498; discussion, p. 498-500.

Basic principles of corrosion not involving stray currents, and how they apply to the problems of lead cable-sheath corrosion. (Presented at Annual Meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6-268. Inhibiting Subsurface Sulphide Corrosion. P. L. Menaul. *World Oil*, v. 127, Oct. 1947, p. 150-152, 155.

A means for inhibiting such corrosion through the addition of formaldehyde to the production stream, and financial gain or loss through such practice.

6-269. Effect of Carbide Structure on Corrosion Resistance of Steel. R. W. Manuel. *Steel*, v. 121, Oct. 13, 1947, p. 82-84, 126, 130, 133, 136, 138.

Reprinted from *Corrosion*, v. 3, Sept. 1947, p. 415-431 (see item 6-238).

6-270. The Effect of Anions on the Performance of Sacrificial Anodes. K. M. Wight. *American Gas Association Proceedings*, 1946, p. 304-320.

Data collected during one phase of an investigation initiated to study the factors involved in the cathodic protection of iron in soils by the use of sacrificial anodes. Aluminum, magnesium, and zinc were selected for experimental study.

6-271. Contribution to the Electrochemical Theory of the Solution of Metals by Acids. Parts II and III. Ia. V. Durdin. *Journal of General Chemistry (U.S.S.R.)*, v. 17(79), May 1947, p. 844-872. (In Russian.)

The use of the "theory of local elements" to express the rate of solution of metals by acids is evaluated. Use of equations for the rates of electrode processes rather than the above theory is indicated to be preferable. An attempt is made to divide the electrochemical series of metals into three groups: those in which the kinetics of solution by acids are determined by electrode processes; those determined by diffusion processes; and those of a mixed type. Influence of conditions of solution. 26 ref.

6-272. Influence de l'Orientation Cristalline sur l'Oxydation a Chaud du Fer et du Cuivre. (Effect of Crystal Orientation on Hot Oxidation of Iron and Copper.) Jacques Benard and Jean Talbot. *Comptes Rendus*, v. 225, Sept. 1, 1947, p. 411-413.

Iron and copper samples which had been subjected to mechanical working were heated and the rate of oxidation studied. The deformation of polycrystalline copper and iron appears to depend on the unequal rate of oxidation along the crystal planes.

6-273. Hydrogen Attack on Metals at High Temperatures and Pressures. J. Schuyten. *Corrosion and Material Protection*, v. 4, Sept-Oct. 1947, p. 13-18.

A critical review of the literature. Effects on mechanical properties, detection methods, mechanism of attack, and means of preventing or limiting it. 27 ref.

For additional annotations indexed in other sections, see: 11-159; 24-307; 27-219.

(Turn to page 24)

equally attention-arresting "Welding Quiz". This took the form of a series of true-false questions printed in large type on an inclined table, each question followed by two push-button doorbells. When the button above the correct answer was pushed a clear chime rang out; the wrong one brought only a deep-throated angry buzz.

Also at the Bureau of Ships a sample demonstration of the oil-powder method of flaw detection was compared by a witty attendant to the powder on milady's face. When first applied the face powder forms a smooth, homogeneous coating, but as the natural oils of the skin are gradually absorbed by the powder the flaws appear!

Another flaw detection apparatus that is brand new was found in the Magnaflux booth under the name

● *Trustee Walter Jominy (Left) Made the Presentation of the Sauveur Achievement Plaque to F. P. Zimmerli of Barnes-Gibson-Raymond During the Society's Annual Banquet Oct. 23*

"Statiflux". Magnetic powder, blown through a simple air gun onto the surface to be examined, collects in the cracks and crevices representing the flaws. It is limited to nonconductors such as searching out flaws in porcelain enamel that even the electron microscope will not pick up.

Magnaflux Corp. also showed the Sonigage, originally devised in the General Motors Research Laboratories for measuring thickness of metal parts from one side only by means of ultrasonic waves. A simple electronic oscillator generates electrical voltage. Since resonant frequency and thickness of the part are related, the instrument is calibrated to read thickness directly. Its range is 0.0015 to 0.3 in.; thicknesses up to several inches may be read by using a multiplying formula.

Promptly at six o'clock the last curious visitor was eased out of the Amphitheatre so that tired A.S.M. members and guests could repair to the **Palmer House and relax in the friendly conviviality and social pomp of the annual banquet. Four medal awards were duly presented and gracefully acknowledged by their recipients (see** September *Metals Review,* page 17). Pièce de résistance was Robert F. Bacher's speech on "The Metallurgist and Atomic Energy". As the scientist member of the U. S. Atomic Energy Commission, he ably traced the development and metallurgical possibilities of tracer isotopes and predicted an important role for the metallurgist in developing materials with the necessary high-temperature and nuclear properties for manufacturing atomic energy for power purposes. The complete text of Dr. Bacher's address is published in the November issue of *Metal Progress.*

●

Friday, Oct. 24—Busy up to the closing minutes of the Exposition was the operator in Air Reduction's automatic Heliwelding booth, demonstrating how this electronically controlled unit maintains constant arc length, assuring a uniform weld even when the work has inherent irregularities.

Featured by Progressive Welder was the fact that the company's stored-energy spot welders are now using a balanced three-phase power system instead of storage batteries in some equipment. A simple motor-generator set requiring the minimum of maintenance builds up kinetic energy in a heavy flywheel. When the high electrical load is applied during the making of a spot weld, the generator is kept turning by the flywheel and some of this mechanical energy is reconverted into electrical current. To deliver as much as 50,000 amp. of direct current the unit requires only an ordinary 15 or 25-hp. motor.

Simplicity is also claimed for the Dial-Lectric control introduced by Harnischfeger Corp. Cranks and wheels in transformer welders are replaced by a rheostat in a little box that can be mounted either on the welder or at some remote control point. The control also provides for two separate ranges so that the large industrial machine with up to 650 amp. capacity can also be used in the low range down to 40 amp.

Originality and ingenuity must have been the traits of the designer of the Gyra-Flow, a piece of automatic finishing equipment in which the ordinary space-consuming conveyer system on which parts travel through bulky spray booths and drying ovens is replaced by an endless belt spirally wound around drums. Parts are attached to the belt with ingenious clips and buttons, carried around the drum, dipped into a small gravity-fed paint trough at the bottom, and spiraled around the drum long enough to distribute the paint evenly without fatty edges. The belt then enters the drying chamber and spirals around a second drum for a sufficient number of turns to give the required baking time.

According to the manufacturer, George Koch Sons, Inc., the model shown at the show was purely an experimental and display unit. Several installations are on order and on the drawing board, designed for various combinations of cleaning, rinsing, drying, and other finishing operations.

At 5:30 p.m. the last registration badge was typed out, the halls gradually began to empty, and by six o'clock furniture started rolling down the aisles, crates rolling in, and the din of break-up began. Total registration recorded at the Internationa' Amphitheatre, at the Palmer House (A.S.M. headquarters), the Sherman (A.W.S.), Stevens (A.I.M.E.), and Morrison (Radium and X-Ray Society) was 39,199. Total attendance is computed in round numbers as 55,000.

Compliments

To the PUGET SOUND CHAPTER on sponsoring an actual demonstration of a Jominy hardenability test at one of its regular meetings; and to LEON N. OLBERG, metallurgist for Western Gear Works, Seattle, for his performance of the test and arrangements for installing the necessary equipment in the meeting room.

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To CHARLES E. CODD, early member of the Rochester Chapter, on his retirement after 47 years with the Ritter Co., Inc.

-※-

To WENDELL F. HESS on his appointment as head of the department of metallurgical engineering at Rensselaer Polytechnic Institute.

-※-

To B. L. AVERBACH on his appointment as assistant professor of metallurgy at Massachusetts Institute of Technology.

-※-

To BRUCE S. OLD on his appointment as consultant to the Atomic Energy Commission's division of research.

-※-

To ROBERT R. GREGG, foundry manager of Reliance Regulator Co., on his election as an international director of American Foundrymen's Association.

-※-

To LATROBE ELECTRIC STEEL CO., Latrobe, Pa., on receipt of the 1947 Special Achievement Award made yearly by *Materials and Methods* "for achievement in developing new engineering materials which result in higher production and lower cost of manufactured goods"—in this instance, the development of Desegatized brand steels, in which carbide segregation has been virtually eliminated.

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To EUGENE GIFFORD GRACE, chairman of the board of Bethlehem Steel Corp., on the award of the Charles F. Rand Gold Medal of the American Institute of Mining and Metallurgical Engineers, for "distinguished achievement in mining administration".

7 CLEANING & FINISHING

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System of paint research and paint control.

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Reprinted from *ASTM Bulletin*, v. 142, Oct. 1946, p. 9-27.

7-400. Modern Paint Removers. L. E. Kuentzel and A. W. Liger. *Iron Age*, v. 160, Oct. 9, 1947, p. 78-83.

Air Force specifications, some basic considerations concerning the performance of various types of strippers and a number of helpful suggestions for expediting the removal of paint films. 16 ref.

7-401. Electrochemical Surface Treatment of Iron Screening for Use in Reinforced Glass. V. P. Mashovets and A. P. Obukhov. *Journal of Applied Chemistry (U.S.S.R.)*, v. 20, no. 3, 1947, p. 219-224. (In Russian.)

Details of a commercial process which has been worked out for electrochemical degreasing, cleaning, and degasification.

7-402. Passivation Des Aciers Inoxydables. (Passivation of Stainless Steels.) L. Guitton *Métaux et Corrosion*, v. 22, April 1947, p. 47-60.

The first two chapters of a 4-chapter article covering the activity and passivity of stainless steel. A general study is made of passivation conditions with respect to stainless steel. Results of application of findings to cold and hot worked specimens.

7-403. Painting Exterior Steel Surfaces. Rick Mansell. *Corrosion and Material Protection*, v. 4, Sept-Oct. 1947, p. 8-10, 12.

Surface preparation; spray and brush application; application of primer; formulation of the paints; properties of the pigments used; accelerated exposure tests; rust; and types of metal primers and top coats.

(Turn to page 26)

PRIZEWINNERS IN A.S.M. METALLOGRAPHIC EXHIBIT

National Metal Exposition, Chicago, Oct. 18-24, 1947

Irons and Steels (Including Stainless)

First Prize: A. M. White and E. J. Thomas, American Cyanamid Co.
Honorable Mentions: J. D. Fillmer and C. K. Donoho, American Cast Iron Pipe Co.; C. J. Summerfield, Jones & Laughlin Steel Corp.

Toolsteels (Except Carbides)

First Prize: R. H. Hays (See Grand Prize above)
Honorable Mention: J. B. Townsend, Vanadium-Alloys Steel Co.

Light Metals and Alloys

First Prize: C. T. Haller, International Nickel Co.
Honorable Mention: Frederick Gerspacher, Army Air Forces, Air Materiel Command, Wright Field.

Heavy Nonferrous Metals and Alloys

First Prize: George R. Kuhn, W. S. Tyler Co.
Honorable Mentions: Roy L. Anderson, Westinghouse Research Laboratories; Pierre A. Jacquet, Ingenieur-Chimiste I.C.P., Paris, France.

Grand Prize—Best in Show

R. H. Hays, Metallographer
Caterpillar Tractor Co.
Peoria, Ill.

Cast Iron

First Prize: Cornelius A. Johnson, Armour Research Foundation.
Honorable Mention: Frank M. Basye, Burlingame, Calif.

Weld Structures (Including Brazed)

First Prize: R. J. Gray, American Brake Shoe Co.
Honorable Mentions: Roy L. Anderson, Westinghouse Research Laboratories; Hakan Swedenborg, Tekniska Rontgencentralen AB, Stockholm, Sweden.

Surface Phenomena (Including Corrosion Products and Electroplates)

First Prize: F. K. Landgraf and C. O. Worden, % Laboratory of Carl A. Zapffe.
Honorable Mention: L. E. Samuels, Munitions Supply Laboratories, Lidcombe, N.S.W., Australia.

Powder Metals (and Carbides)

Honorable Mention: Mellon Institute of Industrial Research (E. W. Kempton, Jr., Metallographer).

Series Showing Transitions or Changes During Processing

First Prize: Roger H. Long, National Advisory Committee for Aeronautics, Aircraft Engine Research Laboratory.
Honorable Mentions: F. G. Foster, Bell Telephone Laboratories; T. Barkin, Institute for the Study of Metals, University of Chicago.

Macrographs

First Prize: E. P. Gruca and B. Karnisky, Welding Engineering Department, Pullman Standard Car Mfg. Co.
Honorable Mention: H. W. Sulser, A. M. Byers Co.

Unconventional Techniques

First Prize: E. G. Davis and A. M. White, American Cyanamid Co.
Honorable Mentions: Alex Blazy, Cleveland Graphite Bronze Co.; Gordon C. Woodside, Climax Molybdenum Corp.; F. W. Von Batchelder, Naval Research Laboratory.

The Reviewing Stand

IN A CONTINUING effort to improve and perfect the Review of Metal Literature, two suggestions have been acted upon during the past year. One was to extend the coverage of foreign publications and the other was to improve the indexing and classification.

When the Review of Metal Literature was inaugurated in 1944, foreign publications other than British were virtually unobtainable because of the war. Even now their delivery is slow and uncertain, but the library staff at Battelle Memorial Institute has made every effort to secure all that are obtainable. The Battelle library also is fortunate in having at its command a staff of trained researchers familiar with foreign languages, so that they are able to prepare good translations of titles and accurate annotations of the articles.

From a list of six publications with only a scattering of articles annotated during 1944, foreign coverage has now grown to 50 journals. These may be broken down as follows: Russian, 17; Swiss, 5; Swedish, 3; German, 3; French, 12; Australian, 1; Dutch, 2; African, 1; Indian, 1; Scottish, 1; Czechoslovakian, 2; Italian, 1; Spanish, 1. Readers may be assured that as other publications become available, they will be added to the list.

The problem of indexing and classification is, of course, well taken care of in the annual bound volumes by the addition of a thorough and exhaustive subject and author index. The short production schedule of the monthly issues makes such indexing impossible, but an effort is being made to compensate for this lack by the addition of cross-references at the end of each of the 27 sections to articles in other sections which could be classified under more than one subject.

The editors and publishers are convinced that the timeliness of the service provided by the monthly issues is more to be desired than an exhaustive monthly index. When *Metals Review* goes to press on the 15th of the month it contains annotations of all magazines received in the library of Battelle Memorial Institute by the 25th of the preceding month—a schedule that provides "the most timely and prompt publication in the world in its field".*

M. R. H.

*Quotation from book review by Emory C. Skarshaug published in *Metal Progress* for September.

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Reprinted from *Steel*, May 5, 1947 (see item 7-174).

7-399. Principles of Immersion and Humidity Testing of Metal Protective Paints. A. C. Elm. *Corrosion*, v. 4, Oct. 1947, p. 501-509; discussion, p. 509-538.

Reprinted from *ASTM Bulletin*, v. 142, Oct. 1946, p. 9-27.

7-400. Modern Paint Removers. L. E. Kuentzel and A. W. Liger. *Iron Age*, v. 160, Oct. 9, 1947, p. 78-83.

Air Force specifications, some basic considerations concerning the performance of various types of strippers and a number of helpful suggestions for expediting the removal of paint films. 16 ref.

7-401. Electrochemical Surface Treatment of Iron Screening for Use in Reinforced Glass. V. P. Mashovets and A. P. Obukhov. *Journal of Applied Chemistry (U.S.S.R.)*, v. 20, no. 3, 1947, p. 219-224. (In Russian.)

Details of a commercial process which has been worked out for electrochemical degreasing, cleaning, and degasification.

7-402. Passivation Des Aciers Inoxydables. (Passivation of Stainless Steels.) L. Guitton *Métaux et Corrosion*, v. 22, April 1947, p. 47-60.

The first two chapters of a 4-chapter article covering the activity and passivity of stainless steel. A general study is made of passivation conditions with respect to stainless steel. Results of application of findings to cold and hot worked specimens.

7-403. Painting Exterior Steel Surfaces. Rick Mansell. *Corrosion and Material Protection*, v. 4, Sept-Oct. 1947, p. 8-10, 12.

Surface preparation; spray and brush application; application of primer; formulation of the paints; properties of the pigments used; accelerated exposure tests; rust; and types of metal primers and top coats.

(Turn to page 26)

PRIZEWINNERS IN A.S.M. METALLOGRAPHIC EXHIBIT

National Metal Exposition, Chicago, Oct. 18-24, 1947

Irons and Steels (Including Stainless)

First Prize: A. M. White and E. J. Thomas, American Cyanamid Co.
Honorable Mentions: J. D. Fillmer and C. K. Donoho, American Cast Iron Pipe Co.; C. J. Summerfield, Jones & Laughlin Steel Corp.

Toolsteels (Except Carbides)

First Prize: R. H. Hays (See Grand Prize above)
Honorable Mention: J. B. Townsend, Vanadium-Alloys Steel Co.

Light Metals and Alloys

First Prize: C. T. Haller, International Nickel Co.
Honorable Mention: Frederick Gerspacher, Army Air Forces, Air Materiel Command, Wright Field.

Heavy Nonferrous Metals and Alloys

First Prize: George R. Kuhn, W. S. Tyler Co.
Honorable Mentions: Roy L. Anderson, Westinghouse Research Laboratories; Pierre A. Jacquet, Ingenieur-Chimiste I.C.P., Paris, France.

Grand Prize—Best in Show

R. H. Hays, Metallographer
Caterpillar Tractor Co.
Peoria, Ill.

Cast Iron

First Prize: Cornelius A. Johnson, Armour Research Foundation.
Honorable Mention: Frank M. Basye, Burlingame, Calif.

Weld Structures (Including Brazed)

First Prize: R. J. Gray, American Brake Shoe Co.
Honorable Mentions: Roy L. Anderson, Westinghouse Research Laboratories; Hakan Swedenborg, Tekniska Rontgencentralen AB, Stockholm, Sweden.

Surface Phenomena (Including Corrosion Products and Electroplates)

First Prize: F. K. Landgraf and C. O. Worden, % Laboratory of Carl A. Zapffe.
Honorable Mention: L. E. Samuels, Munitions Supply Laboratories, Lidcombe, N.S.W., Australia.

Powder Metals (and Carbides)

Honorable Mention: Mellon Institute of Industrial Research (E. W. Kempton, Jr., Metallographer).

Series Showing Transitions or Changes During Processing

First Prize: Roger H. Long, National Advisory Committee for Aeronautics, Aircraft Engine Research Laboratory.
Honorable Mentions: F. G. Foster, Bell Telephone Laboratories; T. Barkin, Institute for the Study of Metals, University of Chicago.

Macrographs

First Prize: E. P. Gruca and B. Karnisky, Welding Engineering Department, Pullman Standard Car Mfg. Co.
Honorable Mention: H. W. Sulser, A. M. Byers Co.

Unconventional Techniques

First Prize: E. G. Davis and A. M. White, American Cyanamid Co.
Honorable Mentions: Alex Blazy, Cleveland Graphite Bronze Co.; Gordon C. Woodside, Climax Molybdenum Corp.; F. W. Von Batchelder, Naval Research Laboratory.

The Reviewing Stand

IN A CONTINUING effort to improve and perfect the Review of Metal Literature, two suggestions have been acted upon during the past year. One was to extend the coverage of foreign publications and the other was to improve the indexing and classification.

When the Review of Metal Literature was inaugurated in 1944, foreign publications other than British were virtually unobtainable because of the war. Even now their delivery is slow and uncertain, but the library staff at Battelle Memorial Institute has made every effort to secure all that are obtainable. The Battelle library also is fortunate in having at its command a staff of trained researchers familiar with foreign languages, so that they are able to prepare good translations of titles and accurate annotations of the articles.

From a list of six publications with only a scattering of articles annotated during 1944, foreign coverage has now grown to 50 journals. These may be broken down as follows: Russian, 17; Swiss, 5; Swedish, 3; German, 3; French, 12; Australian, 1; Dutch, 2; African, 1; Indian, 1; Scottish, 1; Czechoslovakian, 2; Italian, 1; Spanish, 1. Readers may be assured that as other publications become available, they will be added to the list.

The problem of indexing and classification is, of course, well taken care of in the annual bound volumes by the addition of a thorough and exhaustive subject and author index. The short production schedule of the monthly issues makes such indexing impossible, but an effort is being made to compensate for this lack by the addition of cross-references at the end of each of the 27 sections to articles in other sections which could be classified under more than one subject.

The editors and publishers are convinced that the timeliness of the service provided by the monthly issues is more to be desired than an exhaustive monthly index. When *Metals Review* goes to press on the 15th of the month it contains annotations of all magazines received in the library of Battelle Memorial Institute by the 25th of the preceding month—a schedule that provides "the most timely and prompt publication in the world in its field".*

M. R. H.

*Quotation from book review by Emory C. Skarshaug published in *Metal Progress* for September.

7-404. Tin Undercoating Improves Rust Resistance of Steel. *Iron Age*, v. 160, Oct. 23, 1947, p. 45.

Use of a 0.00005-in. thick coating on mild steel before painting is recommended. (From report of Tin Research Institute.)

For additional annotations indexed in other sections, see: 9-145; 11-155; 16-119; 19-313-319; 23-376; 27-231-233.

399 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

8 ELECTROPLATING

8-146. Plating Quality Studied. *Iron Age*, v. 160, Sept. 25, 1947, p. 81-82, 136-137.

A series of reports on various problems of the electroplater. Buffability of nickel deposits; porosity; analysis of plating baths; effect of copper in nickel solutions. (Papers presented at the 1947 annual convention of the American Electroplaters' Society.)

8-147. The Application of the Spekker Photo-Electric Absorptiometer to the Analysis of Chromium Plating Solutions. W. J. Bayley. *Journal of the Electrodepositors' Technical Society*, v. 22, 1947, p. 121-128. (Reprint.)

Methods for the rapid determination of trivalent and hexavalent chromium and iron using the above instrument.

8-148. The Design and Use of a Photoelectric Absorptiometer for the Analysis of Solutions Employed for the Electrodeposition of Hard Chromium. H. E. Styles. *Journal of the Electrodepositors' Technical Society*, v. 22, 1947, p. 129-154. (Reprint.)

Changes in chemical composition resulting from the use of chromic acid solution for electrodeposition. Causes of such changes, effects, and methods whereby the solution composition may be maintained within satisfactory working limits. A photo-electric absorptiometer which is particularly suitable for turbidimetric measurements; details for the absorptiometric estimation of the sulphate, chromium contents of plating solutions. Barium chloride as a reagent for sulphate ion; an absorptiometric method for estimating small concentrations of sulphate in water.

8-149. A Review of F.I.A.T. Final Report No. 879: The Peeling of Nickel Deposits. *Chemical Age*, v. 57, Sept. 6, 1947, p. 330, 332.

The causes of peeling of electrodeposited nickel coatings and the various means of correcting.

8-150. Anodes. Part III—Cast and Rolled 70-30 and 80-20 Brass. E. R. Thews. *Metal Industry*, v. 71, Sept. 12, 1947, p. 225-226.

Physical state of brass anodes, the effect of zinc content, and methods of fault determination.

8-151. Mechanical Properties of Nickel Deposits. E. J. Roehl. *Monthly Review*, v. 34, Oct. 1947, p. 1129-1140.

Experimental data for electrodeposits produced from an all-chloride bath and a typical Watts bath. Effects of pH, solution temperature, current density, and annealing temperature and time, on hardness, ductility, and tensile strength.

8-152. Anodizing—What It Is and How It's Done. Rick Mansell. *Canadian Metals & Metallurgical Industries*, v. 10, Sept. 1947, p. 23, 25-26.

8-153. Plated Zinc-Base Die Castings. E. J. Roehl. *Metal Finishing*, v. 45, Oct. 1947, p. 63-67.

A résumé of modern methods for plating zinc-base die castings.

8-154. Electroplating Control Laboratory. (Concluded.) H. J. Sedusky and J. B. Mohler. *Metal Finishing*, v. 45, Oct. 1947, p. 68-71, 74.

Determination of surface tension and conductivity; colorimetry; polarography; instrument selection; tanks; temperature and liquid-level control; chemicals; tools; electrolytic analyses; small-scale plating.

8-155. Fluid Mechanics: Forgotten Factor in Electroplating. Joseph B. Kushner. *Metal Finishing*, v. 45, Oct. 1947, p. 72-74.

Importance of fluid mechanics to the electroplater, fundamental principles, and necessity for research along these lines.

8-156. Toxicity of Chemicals in Electroplating. (Concluded.) P. M. Van Arsdell. *Metal Finishing*, v. 45, Oct. 1947, p. 75-81.

Silver and its salts; tin and its salts; zinc and its salts; acids; alkalies; cyanides; sulphides; sulphates; oxalic acid; hydrogen fluoride; the fluosilicates and fluoborates; and neutral solutions. Toxic reactions and first-aid procedures.

For additional annotations indexed in other sections, see: 7-375; 11-156; 23-396; 27-233.

162 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

9 PHYSICAL TESTING

9-123. La Résilience. (Resilience.) H. Jolivet. *Revue de Métallurgie*, v. 43, Nov-Dec. 1946, p. 318-326.

Tests for resilience, their history, background, and usefulness. Such values are believed to be quite arbitrary and not of great significance. Improvements in methods are desirable.

9-124. La Mesure du Travail de Rupture au Choc d'Un Coupon de Rail Entaillé. (Measurement of Impact Rupture Fatigue in a Notched Rail Section.) Marcel Perrey. *Revue de Métallurgie*, v. 43, Nov-Dec. 1946, p. 336-346.

Industrial method for measuring fatigue in notched rail sections.

9-125. The Notched-Bar Impact Test Piece. *Engineer*, v. 184, Aug. 29, 1947, p. 197.

Review of two recent articles giving tables and diagrams.

9-126. Notes on Machinability Testing Apparatus and Tests Carried Out at the Naval Ordnance Inspection Department, Sheffield, Including a Development of the Drill Test. D. G. W. Curry. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 244-246; discussion, p. 267-291.

Results for a number of different steels. (War Emergency Issue No. 20.)

9-127. Standardization of Tools for Machinability Tests. C. H. Booth. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 246-247.

Recommended procedures. (War Emergency Issue No. 20.)

9-128. A Tentative Method of Assessment of Machinability. C. W. George. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 248-255; discussion, p. 267-291.

Method indicates to users of specific material the ease of its machinability. Standard test pieces are subjected to a series of standard machining operations. For each, a rating of "free", "medium", or "difficult" is assigned. Ratings for a steel and for an aluminum alloy, obtained by three different companies, are tabulated. (War Emergency Issue No. 20.)

9-129. Tool Wear as a Measure of Machinability. C. Eatough. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 255-257; discussion, p. 267-291.

New test procedure which enables solid test bars of appreciable size to be used, and test results for five steels. (War Emergency Issue No. 20.)

9-130. Testing Methods Using Pendulum Machines. A. S. Kenneford. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 241-243; discussion, p. 267-291.

Oxford-Airey and the Leyensetter machines, and results obtained with the former for effects of feed, depth of cut, and top rake on energy absorbed, effects of cold drawing and grain size on machinability of steel, and effect of lead additions on machinability of 70-30 brass. (War Emergency Issue No. 20.)

9-131. Novy Pristroi Ceskoslovenske Produkce k Mereni Tvrdosti. (A New Czechoslovakian Apparatus for Measuring Hardness.) Jaroslav Dobry. *Hutnické Listy*, v. 1, Feb. 1947, p. 177-180.

Lightness and portability are the advantages claimed, without loss of precision.

9-132. Method for Determining the Depth of Annealing of a Deep Hardening Structural Steel. B. E. Somin. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 832-840. (In Russian.)

Results obtained with new specimens are charted and tabulated and compared with those from other types of specimens. Results are claimed to be more reliable with the new specimens. Data for several Soviet steels, the compositions of which are furnished.

9-133. The Yield Point of High-Chromium Stainless Steels, as Determined by a Cone-Extrusion Method. M. F. Sichikov, B. P. Zakharov, and Iu. V. Kozlova. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 854-858. (In Russian.)

Results of application of above method to two stainless steels. Steel and diamond cones gave practically the same results. Simplifications of the procedure described by Tammann and Müller.

9-134. An Indirect Method for Determining Resistance to Destruction. M. P. Markovets. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 870-878. (In Russian.)

Difficulties connected with determination of the true resistance to fracture of metal test specimens are pointed out and an indirect theoretical method is worked out which is claimed to be superior to any previously proposed. A comparison of the experimental with the calculation method for a series of metals shows an average deviation of 5.8%. Application of the method at high temperatures. 14 ref.

9-135. Utilization of Stamping Devices for Experiments With Sheet Metal. B. P. Zvorono. *Factory Laboratory*

(Turn to page 28)

Chipman Speaks At Philadelphia's Temple Night

Reported by Howard J. Godfrey

Assistant Chief Development Engineer
John Roebling's Sons Co.

Before a large audience composed of members of the Philadelphia Chapter ⊕ and metallurgical students of Temple University, John Chipman, professor of metallurgy at Massachusetts Institute of Technology, lucidly presented a talk on "Metallurgy in the Development of Atomic Energy".

Dr. Chipman was engaged in the development of plutonium at the University of Chicago during the war years and he described many of the metallurgical characteristics of uranium, the element from which plutonium is made.

Metallurgy of Uranium

Uranium, the basis of atomic energy, can be prepared from pitchblende by three methods. In March 1942 there was only 10 lb. of uranium in the United States, and since only 0.7% of uranium is U_{235} (a fissionable material), large quantities of the metal were needed.

Uranium has three allotropic forms and in the annealed condition has a tensile strength of 30,000 to 40,000 psi. Uranium workhardens very rapidly and its strength may be increased to 200,000 psi. by cold working. Phase changes occur at 650 and 750° C. The melting point (which formerly was considered to be 1800° C.) was found to be 1100 to 1150° C.

Uranium is chemically active, forming oxides rapidly at temperatures above 150° F. It may show evidence of internal strains even after furnace cooling from annealing temperatures. The strains are due to the anisotropy of the expansion properties of a single crystal of uranium. Upon heating, a single crystal expands in two directions and contracts slightly in a third direction. As a result, quenched structures contain many strain lines.

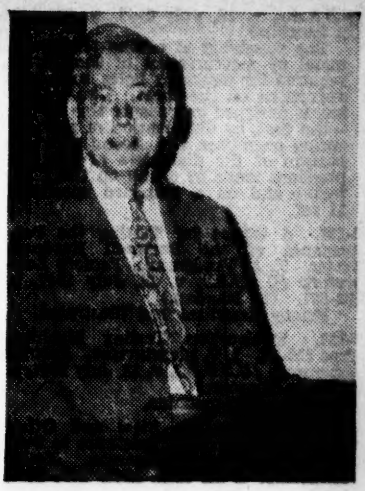
Dr. Chipman illustrated how the nuclear binding energy varies with the atomic weight of the elements and gave a vivid explanation of the internal structure of the atom. The functions of an atomic pile for the manufacture of plutonium from uranium were described in detail.

Thorium and Beryllium Important

Dr. Chipman predicted that thorium and beryllium will be important metals of the future. He also forecast that natural uranium may be the possible source of atomic power. Only one out of every 140 uranium atoms is fissionable and this facilitates the control of the atomic pile. Dr. Chipman concluded his talk with a number of excellent slides of the second atomic bomb experiment which he personally observed at Bikini.

At the dinner meeting held previous to Dr. Chipman's lecture, Chapter Chairman Howard H. Casey, Jr., introduced William T. Cadwell, dean of the College of Liberal Arts & Sciences, Temple University, who announced the new metallurgical course to be given in the day school of the University. H. C. Boynton, former consulting engineer of John A. Roebling's Sons Co. and head of the new metallurgical department at Temple, addressed the dinner meeting. H. C. Knerr, president of Metlab Co. and director of the Evening School of Metallurgy at Temple, gave an interesting review of metallurgical education in Philadelphia.

Considerable interest was shown in the photomicrograph guessing contest. Among the strong contenders was F. B. Foley, superintendent of research for the Midvale Co. and national president of A.S.M.



Professor Chipman Addressing the Philadelphia Chapter

Formability of Cold Reduced Sheets Not Synonymous With Lab Ductility Test

Reported by Hans J. Heine

Chief Metallurgist
Pittsburgh Equitable Meter Div.
Rockwell Mfg. Co.

An unusually large crowd of district metallurgists assembled to hear C. L. Altenburger, research engineer with the alloy division of Great Lakes Steel Corp., Detroit, open the current season of technical meetings sponsored by the Pittsburgh Chapter with a discussion of "Metallurgy of Cold Reduced Sheets".

Because of the magnitude of the subject, only certain important phases of the production and control of cold reduced sheets could be touched upon, and Mr. Altenburger emphasized particularly those which had heretofore been publicized only briefly in the technical literature.

Flat steel products, according to Mr. Altenburger, have become of vast importance in the industrial world, and their production—especially when of comparatively thin gage—by cold reduction and subsequent subcritical annealing has grown enormously in volume. The primary objective with respect to mechanical properties is to obtain a maximum degree of formability in the sheet. The speaker was emphatic in his assertion that this property is not synonymous with ductility as it is ordinarily measured by the common laboratory tests.

As with other steel products, the characteristics of the finished materials are values inherited or greatly influenced by their entire previous history of fabrication; the inherent physical properties which affect formability in all its phases, therefore, are predicated by the methods of manufacture. Mr. Altenburger mentioned a recent development which aims to provide a level of strength considerably beyond that ordinarily exhibited by cold reduced sheets.

Rimmed Steel Used

Turning to actual production problems, the speaker discussed the rimming process of ingoting at length and pointed out that by far the greatest percentage of cold reduced sheet is made from rimmed steel. In an effort to render the steel stable against strain aging, it can be killed with amounts of aluminum in excess of those necessary for deoxidation. The tonnage of semi-killed steel used is rather low, because it is not very desirable from the standpoint of drawability.

Small amounts of vanadium allow the steel to be rimmed well, he said. Moreover, such steel is stable if annealed properly. The speaker explained the solidification of rimming steel ingot and elucidated why certain ingots fall after the boil while others rise.

After a thorough discussion of the influence of sulphur on deep drawing qualities of cold reduced sheets, Mr. Altenburger turned to performance characteristics. The actual performance of metal under satisfactory dies is a function of discontinuities in the microstructure or macrostructure and of discontinuities in the boundary conditions of surfaces and edges. The number of such imperfections is legion, and their study, recognition and elimination is possible by recognizing their connection with the processes, techniques and raw materials from which the steel is made.

The ensuing lively discussion was ably led by the technical chairman, C. M. Lichy of Jones and Laughlin Steel Corp.

(U.S.S.R.), v. 13, July 1947, p. 879-882. (In Russian.)

The possibility of testing thin sheet metal by measurement of the energy required for punching holes and other operations on the sheet. Two instruments designed to measure this energy —the first, by deformation of a heavy spring or rubber, the second by comparison of the diameters of the impressions made by a ball on the sheet tested and on a standard specimen. 11 ref.

9-136. A Device for Testing the Performance of the Rockwell Hardness Tester. T. A. Vvedenskii. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 890-891. (In Russian.)

Briefly described and illustrated.

9-137. Twelve-Ton Testing Machine, Type IM-12. I. V. Kudriavtsev. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 892. (In Russian.)

New Soviet machine.

9-138. Testing Gun Steel and Other Alloys and Metals for Resistance to Surface Cracking. Earl Ingerson. *Metals Technology*, v. 14, Aug. 1947, T.P. 2223, 13 p.

Bore surfaces of used guns usually show a pattern of cracks in various degrees of development. The amount and type of surface cracking taking place in gun steel and various other materials which might be used for gun bores was determined by use of a special test apparatus and procedure. (Presented at Chicago Meeting of A.I.M.E., Oct. 1947.)

9-139. Testing the Superalloys. T. Y. Wilson. *Steel Horizons*, v. 9, no. 4, 1947, p. 14-16.

Test equipment and procedures used in Allegheny Ludlum's laboratories.

9-140. Influence de la Forme Des Lingots-Eprouvettes sur les Résultats Des Essais de Traction des Bronzes a L'Etain. (Influence of the Shape of Test Ingots on the Results of Tension Tests on Tin Bronzes.) Georges Blanc. *Fonderie*, July 1947, p. 721-730.

After experimenting with ingots of various shapes, the French Maritime Service specified the modified cross-shaped ingot, with arms 15 x 15 mm.

9-141. An Indentation Method for Measuring Wear. Samuel A. McKee. *Journal of Research of the National Bureau of Standards*, v. 39, Aug. 1947, p. 155-161.

Method for accurately measuring the wear that takes place on the bearing surfaces of machinery consists of making minute indentations in the wearing surface by means of a specially shaped diamond point and measuring the dimensions of marks before and after wear. Apparatus for using this method for the measurement of wear occurring in the cylinders of aircraft engines. Curves show typical wear data obtained.

9-142. New Indentation Method Determines Equipment Wear. *World Oil*, v. 127, Oct. 1947, p. 104, 108, 110.

Use of McKee wear gage developed by Bureau of Standards.

9-143. Comparison Chart of Degrees of Hardness of Abrasive Minerals. *Production Engineering & Management*, v. 20, Oct. 1947, p. 83.

Compares arbitrary numbers of the Mohs System (year 1818) with degrees of hardness determined by present-day scientific procedures.

9-144. Important Considerations in Charpy and Izod Testing. Part I. C. M. Schwitter. *Product Engineering*, v. 18, Oct. 1947, p. 106-109.

Details of the various types of standard test specimens and the advantages of each. Conditions necessary for accurate results. (To be continued.)

9-145. Hardness of Vapor-Deposited Chromium Coatings. N. S. Gorbunov, N. D. Iudin, and N. A. Izgaryshev. *Journal of Applied Chemistry (U.S.S.R.)*, v. 20, no. 4, 1947, p. 304-308. (In Russian.)

The apparatus used for microhardness testing of these coatings on soft iron, cast iron, steel, and chromansil, and results of the measurements. In most of the cases the content of the base metal had an effect on the hardness of the coating.

9-146. Hardness Testing Method for Small Cylindrical Workpieces. M. C. Attinger. *Industrial Diamond Review*, v. 7, Sept. 1947, p. 264-265.

A chisel edge with only two faces is pressed, at a certain pressure and without shock, perpendicular to the axis of the sample. The surface of the impression is determined after the indenter has been withdrawn. The hardness is given by the ratio of the load to the surface area. The mathematics of the method, the apparatus and technique, and test results. Comparison with Vickers hardness for nine hardened steel cylinders from 0.08 to 0.94 mm. in diameter. (Translated from *Bull. Annuel de la Soc. Suisse de Chronometrie et du Laboratoire Suisse de Recherches Horlogeres (Lausanne)*, v. 2, 1946, p. 321.)

9-147. A New Portable Hardness Tester. *Industrial Diamond Review*, v. 7, Sept. 1947, p. 266.

New British instrument.

9-148. The Micro-Sclerometer: A New Microhardness Tester. M. R. Girschig. *Metallurgia*, v. 36, Sept. 1947, p. 269-273.

New instrument designed for use on metallurgical microscopes possesses a number of interesting features. Applications of the instrument and a comparison of hardness numbers obtained by different loads. (Translated and condensed from *Revue de Metallurgie*, v. 43, 1946, p. 95-112.)

9-149. The Effect of Notching on Materials of Construction Under Static and Dynamic Tension. (Maximum Testing Velocity 29 Ft. per Sec.) Georges Welter. *Metallurgia*, v. 36, Sept. 1947, p. 283-286.

Results of static and dynamic tests performed in order to determine the effect of notches in specimens of various construction materials. Total energy, elongation, and energy absorbed per unit volume, for six different materials, were measured on specimens tested at a rate of straining of 0.005 ft. per sec. and compared with the same values measured on identical specimens strained about 20,000 times faster. Tests confirm previous conclusions to the effect that the dynamic strength of cylindrical 2-in. gage-length specimens, at a speed of 11.78 ft. per sec., is up to 60% higher than the static strength, depending on the material tested; in the case of zinc, it is 100% higher. (To be continued.)

For additional annotations indexed in other sections, see: 3-308-309-325-328-337-339; 19-320-321.

10 ANALYSIS

10-161. Mobile Laboratory Speeds Steel Analysis. H. A. Tuttle and G. A. Nahstoll. *Iron Age*, v. 160, Sept. 25, 1947, p. 68-72.

Mobile laboratory at Ford Motor Co. Rouge plant permits applications of analytical control heretofore impossible. The equipment, analytical methods, and important applications. Specialized spectroscope used for semi-quantitative analysis of steel. 12 ref.

10-162. Determination of Fluorine in Metallic Preparations. Iu. A. Chernikhov and E. I. Vendel'shtein. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 815-816. (In Russian.)

A special method involving fusion with Na_2CO_3, suitable for the zirconates, which often have to be analyzed in connection with the production of metallic zirconium.

10-163. The Separation of Titanium From Aluminum and Iron, Using Fluorides. Sh. T. Talipov and Z. T. Sofeikova. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 816-819. (In Russian.)

Method is based on the greater solubility of Na_2TiF_6 in comparison with Na_3AlF_6 and Na_3FeF_6.

10-164. An Electrical Device for the Transfer of Samples During Spectroscopic Analysis. H. S. Sventilskii and K. I. Taganov. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 850-853. (In Russian.)

Method and apparatus are based on the principle of electrical erosion recently applied to machining in the U.S.S.R. A definite amount of the material of the specimen to be analyzed is transferred to a fixed electrode by electro-erosion, then the specimen electrode is replaced by another one like the fixed one. An arc is struck, and the time during which the characteristic lines of the element being determined are visible is considered to be proportional to the percentage composition.

10-165. Apparatus for Rapid Determination of Hydrogen in Steel. V. Ia. Dubovoi and V. A. Romanov. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 883-884. (In Russian.)

Details of construction and operation of apparatus. It is claimed to be more suitable for industrial use than previously described equipment because of greater simplicity of construction and rapidity of analysis.

10-166. Spectrographic Determination of the Content of Arsenic in Steel. O. I. Nikitina. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 885. (In Russian.)

Details of the method used including typical results and a chart for determining the arsenic concentration from the spectral measurements.

10-167. Sorting of Pig Iron According to Silicon Content by Means of a Thermoelectric Instrument. A. V. Golovin. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 886-887. (In Russian.)

It was found that pig scrap containing 0.17 to 0.37% Si produced a negative galvanometer deflection, as compared with a positive deflection for higher contents. It was also found possible to approach very closely to true Si analyses by use of the instrument, the circuit of which is given. Results for a long series of steels with varying Si contents.

10-168. Spectrographic Analysis; Brass and Bronze Ingot Production. G. E. Staahl and G. P. Halliwell. *American Foundryman*, v. 12, Sept. 1947, p. 51-57.

The use of the spectrograph in the production of copper-base foundry ingots. Among the applications discussed are the control of furnace production, the analysis of scrap and stock materials, the sorting of metals, the analysis of samples from outside sources, and use as a qualitative aid to the chemical department.

10-169. Spectrographic Examination of Organic Precipitates; Nickel Dimethylglyoxime. Margaret Griffing, Thos. De Vries, and M. G. Mellon. *Analytical Chemistry*, v. 19, Sept. 1947, p. 654-655.

Separation of Ni from seven times its weight of Sb, As, Ba, Cd, Ca, Mg, K, Na, St and Zn was obtained by precipitation with dimethylglyoxime. Al, Cr, Cu, and Mn were definitely co-

(Turn to page 30)

New Analyses, Treatments and Tests Broaden Uses of Toolsteels

Reported by Robert T. Hook

Warner & Swasey Co.

In the opening meeting of the Cleveland Chapter for 1947-48, George A. Roberts, chief metallurgist of the Vanadium-Alloys Steel Co., discussed the principal developments in the field of toolsteels over a period of several years. Dr. Roberts spoke about carbon toolsteels, die steels for cold and hot work, and high speed steels, giving new analyses and treatments for broader uses of these steels.

The refinement of the hardenability test known as the P-V test has been the primary development in the field of carbon toolsteel metallurgy, Dr. Roberts said. This method simplifies the testing of toolsteels with shallow hardening characteristics and can in many instances replace the more tedious P-F or disk tests. It is a modified end-quench hardenability test, using a 90° angle cut on the end of bar stock from 1¼ to 1¾ in. in diameter and is more simple than various other wedge or cone tests.

In the field of cold work die steels, various manganese air hardening steels have been developed over the past nine years. These steels (2 to 3% Mn, 1 to 2% Cr, 1 to 1.50% Mo, 0.70 to 1% C) are designed to compete with the older manganese oil hardening steels or chromium air hardening steels. Manganese lowers the critical temperature while increasing hardenability and thus air hardening from low temperatures (1450 to 1650° F.) is possible. On the other hand, manganese is not a carbide-forming element and these steels have less wear resistance than the chromium air hardening types.

The second development in the cold work die steel field is the extension of subzero treatments to the 5 and 12% chromium die steels. These steels are susceptible to large amounts of retained austenite as quenched, and subzero treatments may be used both as a correction for overheating and as a means of obtaining a higher level of hardness.

Developments in the hot work die steels involve new free-machining types of steels, stemming from the development of graphitic steels. Recently two similar medium-alloy steels with free-machining properties have been introduced for die-casting dies, backer plates, plastic dies and other machinery applications with medium hardness requirements. They may be purchased at hardnesses of from 275 to 300 Brinell (up to 160,000 psi. tensile strength) and can be machined at this strength level.

Another group of materials now in the initial industrial development stage is precipitation hardening low-alloy steels with low carbon content. They are furnished in the quenched condition, can be machined and then tempered to the desired level for medium hardness applications.

Several attempts have been made to eliminate or reduce heat checking by developing hot work die steels with high critical temperatures. One such group of materials is called molybdenum alpha irons; it contains 0.10 to 0.20% carbon, with 3 to 5% molybdenum. These materials have a limited maximum hardness of about Rockwell C-45 and a limited hardenability, but are employed where high cross sectional strength and rigidity are not necessary.

A patented material with 12% tungsten, 12% chromium and 0.30% carbon also involves a high critical temperature and fair resistance to heat checking. This steel has been applied for permanent molds for brass and bronze casting, for brass die-casting dies and for brass tube extrusion dies.

The final development in the field of hot work die steels is the much-debated addition of vanadium to the 5% Cr, 1% Mo, 0.35% C steel. Vanadium increases to a significant degree the hot hardness of this material and changes the hardening and tempering reactions to some extent. Its advantages are not yet clearly outlined, since reports from consumers are conflicting.

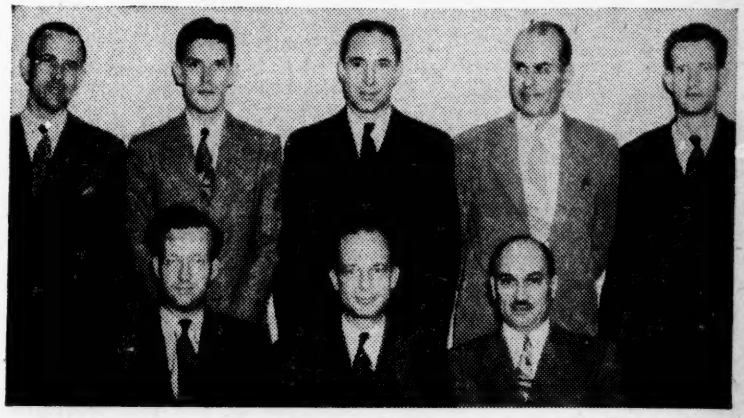
High speed steel developments include alterations of composition, heat treatment and methods of testing. Molybdenum-base steels (now favored on a temporary basis because of price differential) are being modified for special applications. One molybdenum high speed steel adds boron, another titanium, and one—now nine years old—added extra vanadium for several years before it was modified to a molybdenum-tungsten type with the same extra vanadium.

Presenting data taken from a paper delivered before the National Metal Congress in October, the speaker described the application of the bend test in determining the properties of high speed steel as a function of various heat treatments.

Finally, a brief description was given of the process of carburizing high speed steels in charcoal at 1950° F. for the purpose of improving wear resistance and edge strength for certain blanking, trimming and forming dies.

The coffee talk was replaced with a U. S. Navy film, "Operation Crossroads", depicting the Bikini bomb test.

Rome Chapter Officers at October Meeting



Officers and Executive Committee of the New Rome Chapter ● Are (Standing, Left to Right): L. R. Dickinson, C. E. Thayer, L. E. Gibbs, Maurice G. Steele, and W. E. Moulton. Seated are L. H. Decker, secretary-treasurer; R. Carson Dalzell, chairman; and G. J. Rich. R. C. Graham was absent at the time of the photograph

Reported by Maurice G. Steele

Kent Electric Corp.

Richard H. Gehr of General Electric Co.'s Albany plant spoke on "High Frequency Brazing and Surface Hardening" before the fourth meeting of the fledgling Rome Chapter ● on Oct. 6. High frequency heating, Mr. Gehr said, is rapidly coming into general use, particularly in the joining and production of parts.

L. R. Dickinson, program chairman, presided at the meeting. Previous to Mr. Gehr's talk, announcement was made that Revere Copper and Brass, Inc., and Spargo Wire Co. have taken out sustaining memberships.

precipitated. The error introduced by the Cr and Mn was insignificant.

10-170. Improved Dithizone Method for Determination of Lead; Mixed-Color Micromethod at High pH. L. J. Snyder. *Analytical Chemistry*, v. 19, Sept. 1947. p 684-687.

New procedure based on extraction of lead from aqueous solution at pH 11.5. A saving in time and an improvement in convenience and flexibility are claimed. 18 ref.

10-171. Stable Colorimetric Reagent for Chromium. J. F. Ege, Jr., and Leslie Silverman. *Analytical Chemistry*, v. 19, Sept. 1947, p. 693-694.

In a modification of the S-diphenyl carbazide reagent for the colorimetric determination of hexavalent chromium, the major change is the substitution of phthalic anhydride for the acidic constituent. The resulting reagent is stable for weeks. Its use results in a simplified analytical procedure.

10-172. A New Differential X-Ray Absorption Method for Elementary Chemical Analysis. A. Engstrom. *Review of Scientific Instruments*, v. 18, Sept. 1947, p. 681-682.

Simple apparatus for microchemical analysis by X-ray absorption spectrography of either thin metal foils, sections of biological tissues, or substances in the form of dry powders or aqueous solutions.

10-173. Direct-Reading Spectrometer for Ferrous Analysis. R. O'B. Carpenter, E. DuBois, and J. Sterner. *Journal of the Optical Society of America*, v. 37, Sept. 1947, p. 707-713.

Modification of spectrometer described by Saunderson, Caldecourt, and Peterson. Data on reproducibility of analytical results obtained for Ni, Cr, Si Mn, Cu, Mo, Al, and Sn in steel. Errors introduced are shown to be small.

10-174. L'Analyse Chimique Par Spectrographie D'Emission. (Chemical Analyses by Spectrographic Emission.) E. Loeuille. *Metaux et Corrosion*, v. 22, March 1947, p. 38-45.

Present state of spectrographic analysis in France. Apparatus and methods used. (To be continued.)

10-175. The Spectrographic Analysis of a Complex Ferrous Alloy. C. H. R. Gentry and J. P. Mitchell. *Journal of the Society of Chemical Industry*, v. 66, July 1947, p. 226-232.

Procedure for the analysis of "Ticonal" alloy, a complex ferrous material. To permit the accurate determination of the high-percentage constituents, a concentration-ratio method is used which allows for variations in the content of iron. A modification of the calculating board is suggested to simplify the clerical work involved. The precision of the spectrographic method is shown to compare favorably with that obtainable by routine chemical methods. Suggestions for the accurate spectrographic analysis of any complex material containing high-percentage constituents. 16 ref.

10-176. Applications de la Chromatographie a la Séparation des Métaux Nobles. (Applications of Chromatography to the Separation of Noble Metals.) René Dubrisay. *Comptes Rendus*, v. 225, Aug. 4, 1947, p. 300-302.

Pulverized carbon is put into a glass tube, and a liquid containing silver nitrate and nitrates of other metals in definite proportions is added. Metallic silver separates out, the carbon is dried and then attacked by nitric acid. Analysis for the metals may then be made.

10-177. The Use of Potassium Ethylxanthogenate for Quantitative Estimation of Zinc and Cadmium. M. T. Berkovich. *Journal of Analytical Chemistry (U.S.S.R.)*, v. 2, July-Aug. 1947, p. 215-218. (In Russian.)

Method of indirect potentiometric titration of zinc and cadmium ethylxanthogenates and a method for quantitative separation of cadmium from zinc.

10-178. A Quantitative Spectroscopic Estimation of Cobalt and Nickel by Utilizing the Spectrogram Background Radiation. L. N. Ovchinnikov. *Journal of Analytical Chemistry (U.S.S.R.)*, v. 2, July-Aug. 1947, p. 225-228. (In Russian.)

Application to estimation of Co and Ni in copper ores.

10-179. Spectral Analysis of Microscopic Inclusions, Coatings, and Precipitates. S. A. Baravie and L. N. Indichenko. *Journal of Analytical Chemistry (U.S.S.R.)*, v. 2, July-Aug. 1947, p. 229-230. (In Russian.)

Methods developed for introduction of microsamples into the carbon electrode, by which 8×10^{-9} g. of silver, 9×10^{-9} g. of copper, and 10×10^{-9} g. of iron have been determined.

10-180. The Use of Dry Reagents for Analysis of Ores and Minerals in Field Conditions. N. S. Poluektov and M. P. Nikonova. *Journal of Analytical Chemistry (U.S.S.R.)*, v. 2, July-Aug. 1947, p. 236-238. (In Russian.)

Use of dry reagents for the detection of boron, vanadium, nickel, antimony, and chromium using spot reactions.

10-181. Determination of Impurities in Volatile Metals by Vacuum Distillation. M. Villat. *British Chemical Digest*, v. 1, Sept. 1947, p. 461, 463, 465.

Equipment and procedure. Three modifications which have been used for analysis of Ca, Mg, Cd, Zn, and alkali metals; brasses; and aluminum. Typical results for aluminum. (Translated from thesis presented to L'Ecole Polytechnique Federale, Zurich.)

10-182. Gravimetric Determination of Sulphur in Bronze and Other Nonferrous Alloys With Ferric Chloride Reagent; Qualitative X-Ray Diffraction Examination of Residue. Louis Silverman and William B. Goodman. *Chemist-Analyst*, v. 36, Sept. 1947, p. 28-33.

Ferric chloride reagent compared with cupric potassium chloride as a gravimetric reagent for sulphur. Its advantages in the case of bronze and metallic copper. Possible use in the determination of the composition of nonferrous furnace metals. X-ray diffraction patterns of the ferric chloride and the cupric potassium chloride residues show that sulphur remains as cuprous sulphide and elementary sulphur.

10-183. Determination of Lead in a Graphite-Lead-Tungsten Ore. H. Sharples. *Chemist-Analyst*, v. 36, Sept. 1947, p. 40-41.

It was found necessary to remove tungsten before determining lead by the routine molybdate method.

10-184. Colorimetric Determination of Aluminum in Zinc-Base Die-Casting Alloys. Milton Sherman. *Die Castings*, v. 5, Oct. 1947, p. 23, 42-44.

Method uses alizarin red S as indicator. Accuracy is stated to be $\pm 0.05\%$.

10-185. The Analysis of Nickel-Cobalt-Iron Alloys Used in Glass-to-Metal Seals. R. C. Chirnside, H. J. Cluley, and P. M. C. Proffitt. *Analyst*, v. 72, Aug. 1947, p. 351-359.

Methods for the accurate determination of nickel, cobalt, iron, and manganese in low-expansion alloys used for glass-to-metal seals. Duplicate analyses of a number of commercial alloys. The nature and formation of the Fe-Co-dimethylglyoxime complex. 10 ref.

10-186. Study of Alloxane and Some of Its Derivatives as Analytical Reagents. Leonid Kul'berg. *Journal of General Chemistry (U.S.S.R.)*, v. 17(79), June 1947, p. 1089-1098. (In Russian.)

The mechanism of the Denige reaction with heavy metals. The analytical properties of several derivatives of alloxane.

10-187. Contribution a la Chimie Analytique de l'Indium. (Contribution to the Analytical Chemistry of Indium.) Georges Denigès. *Comptes Rendus*, v. 225, Aug. 25, 1947, p. 369-371.

Four reactions (three of them microcrystalline) present a very simple rapid method for analyzing very small quantities of indium—either free or in compounds. They involve use of the chloride, nitrate, sulphate, and iodate of indium, respectively.

10-188. Identification, par voie Microcristalline, de très Faibles Quantités de Glucinium a l'Etat Métallique. (Identification of Very Small Amounts of Beryllium in the Metallic State by Microcrystalline Methods.) Georges Denigès. *Comptes Rendus*, v. 225, Aug. 25, 1947, p. 474-476.

A method of identification using sulphuric acid. Results of the acid attack may be observed at 100 to 150 diameters magnification.

10-189. Applications of the Polarograph to Metallurgical Analysis. Part III—Further Studies on a Polarographic Method for the Determinations of Lead in Copper Base Alloys. G. W. C. Milner. *Metallurgia*, v. 36, Sept. 1947, p. 287-289

A method previously described is interfered with by manganese. An improved method is suitable for alloys containing appreciable amounts of the interfering element.

10-190. Rapid Chemical Analysis With the Recording Polarograph. M. J. Prendergast. *Instrumentation*, v. 3, 4th Quarter, 1947, p. 19-20.

10-191. Spot Tests for Steel; Cr, Ni, Si, Mn. W. E. Thrun and C. H. Bartelt. *Iron Age*, v. 160, Oct. 23, 1947, p. 40-42.

Nondestructive semiquantitative procedures for these elements with emphasis on the principle of dilution to color extinction for determination of alloy elements present in relatively high percentages.

For additional annotations indexed in other sections, see:
8-147-148; 11-162.

157 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

11 INSTRUMENTS
Laboratory Apparatus

11-144. High-Frequency Permeability of Ferromagnetic Materials. G. Eichholz and G. F. Hodsman. *Nature*, v. 160, Aug. 30, 1947, p. 302-303.

A method for measuring the effective reversible permeability of ferromagnetic materials in wire form over a fairly wide range of frequencies; results for several metals.

11-145. Methodiek en Resultaten Van Het Electronen-Microscopisch Onderzoek Van Metalen. (Method and Results of Electron-Microscopic Investigation of Metals.) D. L. Ingelse. *Metalen*, v. 1, July 1947, p. 203-206.

Concluded.

11-146. Measurement by Induction Heating of the Temperature Variations of the Specific Heats of Ferromagnetic Materials. G. J. Aitchison. *Journal of*

(Turn to page 32)

Purdue Chapter Receives Charter

National President Boegehold (Left) Presents the Charter of the New Purdue Chapter to Chairman Harold Bates of Fairfield Mfg. Co.

Installation of the new Purdue Chapter took place on Sept. 30 with 60 members attending the dinner at Purdue Memorial Union, and approximately 60 more arriving later for the meeting and technical address.

After presentation of the charter to Chairman Harold Bates by National President A. L. Boegehold, the latter presented the technical address on "Correlation of Recent Data on Hardenability". Dean Potter of Purdue University introduced Mr. Boegehold, and George M. Enos, professor of metallurgical engineering at Purdue, acted as toastmaster.

Formal election of officers preceded the technical address, with the following slate installed:

Chairman—Harold Bates, Fairfield Mfg. Co.

Vice-Chairman—T. F. McCormick, Aluminum Co. of America

Secretary-Treasurer—Harold Graves, Indiana Gas & Water Co., Inc.

Norton Offers New Movies

Two new films on grinding practices have recently been offered for bookings by Norton Co., Worcester 6, Mass. The first is a reissue, revised and brought up to date, of "Grinding Carbide Tools", first made in 1944. The second is a companion film, new this year, entitled "The Diamond Wheel, Its Care and Use". In requesting loan of the films, three to four weeks' advance notice is desirable.

Warren Petroleum Gets Eastern Office

Warren Petroleum Corp. is opening a liquefied petroleum sales office at 60 Park Place, Newark, N. J., with C. L. Hulswitt, formerly manager of the Detroit office, in charge. This eastern sales office is made possible by the shipment of gas by tankers from Texas to the new marine LP-gas terminal now under construction at Newark. Deliveries will start early in December 1947.

Powder Metallurgy Applied to Machine Parts Described

Reported by J. W. Sweet

Chief Metallurgist, Boeing Aircraft Co.

Powder metallurgy as applied to bearings and machine parts inaugurated the year's program of the Puget Sound Chapter at a meeting held Sept. 17. The members spent an informative evening listening to A. J. Langhammer, president of the Chrysler Corp., Amplex Division.

Mr. Langhammer described the 90% copper, 10% tin powder mixture for bearings and machine parts such as gears, which is compressed into the desired shape and sintered, resulting in a sponge-like structure. The metal is then impregnated with oil and becomes a self-lubricated, oil-cushioned bearing. Die costs are not prohibitive, and in small quantities bearings weighing as much as 230 lb. have been made. A large variety of cored bar stock is available.

Machine parts made by powder metallurgy are replacing die castings, cast iron parts and light stampings, according to Mr. Langhammer. Prior to the war most of the iron powder for such parts came from Europe, and the speaker praised the American manufacturers who undertook the job of establishing a source in the United States. They developed a superior product which allows higher stresses in machine parts.

During the late stress period powder metallurgy was used in the mass production of precision tools such as micrometer frames and toolmaker's V-blocks.

Quality Control Engineer's Duty Is to Buying Public

Reported by L. W. Thelin

Quality Supervisor
Chase Brass & Copper Co.

The number one responsibility of the quality control engineer is to the buying public, E. E. Folsom, engineer of quality control in the appliance and merchandise dept. of General Electric Co., Bridgeport, Conn., told the New Haven Chapter at its September meeting. Mr. Folsom described several applications of G.E.'s control methods for competitive manufactured articles, drawing much of his factual data from work on washing machines and refrigerator units.

Quality inspection of incoming materials from various vendors presents problems in maintaining high quality levels because of present-day necessity for substitution of materials not originally used in the manufactured items.

Sampling schedules used at General Electric are, in general, drawn from Dodge-Romig sampling tables. Mr. Folsom demonstrated how sources of variability are determined both within a given lot and within the pieces themselves. He also exhibited control charts showing the trends in quality of various suppliers' products.

Mr. Folsom gave a detailed description of a rotor bushing which had a close tolerance on the inside diameter. By using plug gages on the bored hole, a careful analysis was made and dimensional trouble traced back to its source.

An ultimate result of the quality control program at G.E. is to place the emphasis on quality with the machine operator. With this plan, if operation is out of control, the operator can immediately do something about it and make necessary changes to keep the manufactured part within limits set up by the control group.

The speaker described the "quality audit", which is a final check or a continual check on the over-all quality of the finished item in the shipping or stockroom. The audit gives an accurate picture of the final quality of the finished piece of merchandise.

New Research Institute Opened

Southwest Research Institute, San Antonio, Texas, a nonprofit scientific organization designed to aid southwestern industry solve its technological problems, recently opened its laboratories and has already contracted for several projects sponsored by industrial corporations. The Institute was built along the lines of Midwest, Armour, Battelle and Mellon Institutes to conduct industrial research on a fee basis. Under its charter, sponsoring manufacturers or trade associations retain patent rights on all discoveries accruing from research projects.

Scientific Instruments, v. 24, Aug. 1947, p 200-202.

In a suitably designed high-frequency induction furnace, it was possible to supply heat to a specimen at a rate which remained approximately constant over a wide temperature range. By measuring the rates of temperature rise at different temperatures, and correcting for cooling, graphs were prepared showing approximately the variation of specific heat with temperature. 12 ref.

11-147. High Vacuum Technology. Richard S. Morse. *Industrial and Engineering Chemistry*, v. 39, Sept. 1947, p. 1064-1071.

Recently developed equipment and process plants which employ pressures in the micron range. Discussion is limited to industrial applications at 10^{-3} to 10^{-4} mm. in such fields as dehydration, metallurgy, distillation, metal evaporation. Operating data. 24 ref.

11-148. Mikroradiografie. (Microradiography.) Rudolf Pospisil. *Hutnicke Listy*, v. 1, March 1947, p. 193-197.

Principles and procedures of radiography using X-rays and the advantages of the use of photo-electrons or microradiography. The latter proved to be more sensitive in distinguishing elements of different atomic numbers than the older absorption method.

11-149. Röntgenografie Kovu a Slitin. (X-Ray Examination of Metals and Alloys.) Petr Skulari. *Ceskoslovenske Hute n. p. Hutnicke Listy*, May 1947 27 p. (Supplement No. 1 to May 1947 issue of *Hutnicke Listy*.)

The methods and apparatus used, and its advantages and disadvantages. Relationships between the structure and properties of metals and alloys. Practical examples from experience in the study of the disintegration of solid solutions. Dependence of mechanical properties on structure and the control of the production of aluminum by X-ray methods.

11-150. Use of a Temperature-Gradient Instrument in Investigating Austenite Decomposition of Alloy Steels. N. E. Karskii and V. V. Balakin. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 840-844. (In Russian.)

The lower part of a rod-shaped specimen is first quenched by dropping it from a vertical tube furnace into water while the upper part remains in the hot zone. After a further period, the rest of the rod is quenched; thus the middle section shows the effects of a complete range of temperatures in one specimen. Results of investigation of a Cr-Ni-Mo steel.

11-151. An Attempt to Find a Universal Etchant for Studying the Microstructure of Nonferrous Metals and Alloys. M. I. Makushenko. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 845-847. (In Russian.)

Solutions of phosphoric acid containing traces of chromic anhydride were found to be suitable for the majority of the nonferrous metals.

11-152. Laboratory High-Frequency Generator for Tempering and Melting Metals. Iu. M. Bogatyrev and M. B. Berezhinskii. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 890-891. (In Russian.)

Circuit diagram and apparatus with output of 4 to 5 kva.

11-153. New Testing Device for Haber-Type Dynamometer. V. I. Chevkinov. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 892. (In Russian.)

Device described and diagrammed. Typical results.

11-154. Quantitative Metallography by Point-Counting and Lineal Analysis. Robert T. Howard and Morris Cohen. *Metals Technology*, v. 14, Aug. 1947, T.P. 2215, 14 p.

Literature on methods for measuring the relative amounts of microconstituents. Point-counting and the Hurlbut counter using austenite-martensite structures as samples. It is shown that both methods are reliable, whereas visual estimates may lead to erroneous results. Linear analysis with the Hurlbut counter is shown to be superior to point-counting in several respects. 28 ref. (Presented at New York Meeting of A.I.M.E., March 1947.)

11-155. Drop Test for Determining Thickness of Zinc Coatings. Richard Springer. *Monthly Review*, v. 34, Oct. 1947, p. 1147.

Simple method widely used in Germany during the past several years.

11-156. Measurement of Thickness of Copper and Nickel Plate. G. B. Bowman. *Monthly Review*, v. 34, Oct. 1947, p. 1149-1151.

Results of comparison of thickness measurements by three methods (microscopic, chemical, and magnetic). Two different commercial instruments were used for the magnetic determination of copper thickness.

11-157. Apparatus for Air Classification of Metal Powders. E. C. Truesdale. *Metal Powder Association Preprint*, 1947, 14 p.

Laboratory instrument based on air elutriation which was found to be capable of accurate fractionation at particle diameters up to 40 microns for spherical particles and to give reproducible results for spherical or nonspherical particles (excepting flakes) up to 75 microns. Modification of the apparatus permitted conversion to a continuous-feed multiple-stage classifier which was capable of sharp particle-size cuts at favorably high-recovery of fines. Results obtainable with each apparatus for a variety of metal powders.

11-158. Dosage d'Eléments Chimiques au Moyen des Spectres d'Etincelle Avec Emploi de Papier Comme Support de la Substance a Analyser. (Analysis of Chemical Elements by Means of Spark Spectra Using Paper as a Support for the Substance to be Analyzed.) Alain Berton. *Comptes Rendus*, v. 225, Aug. 4, 1947, p. 289-290.

It is claimed that ordinary spectrographic techniques do not give accurate quantitative results, because of the irregularity of light emission. To regularize the emission, the equipment was immersed in a regular flow of an aerosol solution. Paper is impregnated with the substance to be analyzed and the arc is passed. Results are quite accurate.

11-159. Chemical State of the Surface of Aluminum and Measurements of the Solution Potential. P. Morize, P. Lacombe, and G. Chaudron. *British Chemical Digest*, v. 1, Sept. 1947, p. 456-458.

Development of a method for defining quantitatively the chemical state of aluminum surface. This was done by measuring solution potential following mechanical and electrolytic polishing. This gives an oxide-free surface suitable for accelerated corrosion tests if the bath is in good condition. Solution-potential measurement also indicates the thickness of oxide films. (Translated from *Journes des Etats de Surface*, 1946.)

11-160. Testing Circular Division With Precision Polygons. C. O. Taylerson. *Machinery (London)*, v. 71, Sept. 18, 1947, p. 327-330, 333.

Use of precision-made 12-sided polygons for checking precision angular-measuring instruments.

11-161. Nondestructive Methods for Determining Metal Plate Thickness. J. G. Kerley. *Corrosion*, v. 3, Oct. 1947, p. 467-481.

Principles and procedures for use of methods utilizing supersonic vibration; thermal conductivity; magnetic characteristics; electrical resistance; electrical induction; and penetrating radiation (X-rays or gamma-rays). 20 ref. (Presented at Annual Meeting of N.A.C.E., Chicago, April 7-10, 1947.)

11-162. L'Analyse Chimique par Spectrographie D'Emission. (Chemical Analysis by Emission Spectrography.) E. Loeuille. *Métaux et Corrosion*, v. 22, April 1947, p. 61-66.

Concluded.

11-163. Applications of Electronic Methods to the Measurement of X-Ray and Gamma Ray Intensities. Herbert Friedman. *Industrial Radiography & Non-Destructive Testing*, v. 6, Summer 1947, p. 9-20.

Modes of operation of the counters and of the photomultiplier X-ray detector, their fundamental efficiencies, their noise characteristics, and their speeds of response. Examples of their applications include strip-metal gaging; measurement of thin coatings; determination of wall thickness of curved sections from one side; liquid-quantity gaging, and X-ray-fluorescence and absorption methods of chemical analysis.

11-164. The Electron Microscope. James Hillier. *Industrial Radiography & Non-Destructive Testing*, v. 6, Summer 1947, p. 25, 28-31.

The instrument, its uses, and techniques employed.

11-165. The Influence of Inherent Filtration of the X-Ray Tube in Industrial Radiography and Fluoroscopy. E. D. Trout and A. L. Pace. *ndustrial Radiography & Non-Destructive Testing*, v. 6, Summer 1947, p. 32-39.

Two papers. One on the theoretical and physical aspects of the inherent filtration of the X-ray unit when used for industrial applications. The second on the influence of inherent filtration on the practical aspects of radiography in the field of high voltage.

11-166. Film Blackening Method for the Measurement of Relative X-Ray Intensities. Donald T. O'Connor. *Industrial Radiography & Non-Destructive Testing*, v. 6, Summer 1947, p. 40-43.

Each of the variables involved in the above process. Recommended techniques. 13 ref.

11-167. Sliding Scales to Increase the Usefulness of Radiographic Exposure Charts. G. M. Corney. *Industrial Radiography & Non-Destructive Testing*, v. 6, Summer 1947, p. 44-46.

Use of scales made on the slide-rule principle to correct for variations in type of film used, film density, and focus-film distance.

11-168. A Densitometer of Unusually High Sensitivity. Monroe H. Sweet. *Industrial Radiography & Non-Destructive Testing*, v. 6, Summer 1947, p. 47-48.

Electron-multiplier-tube densitometer with a linear density scale over a range of 0 to 3.0, and a total range of 0 to 6.0.

11-169. The Application of Etch-Figures on Pure Aluminium (99.99%) to the Study of Some Micrographic Problems. Paul Lacombe and Louis Beaujard. *Journal of the Institute of Metals*, v. 74, Sept. 1947, p. 1-16. (Translated from the French.)

Use of an electrolytic polishing method to reveal etch-figures in a particularly clear manner. This method has enabled the relative orientations between adjacent crystals to be related to the nature of the grain boundaries, to recrystallization due to heat treatment, and to mutual plastic deformations of two adjoining crystals. Single crystals of aluminum are shown to be composed of an aggregate of little crystalline "blocks" whose orientations are very slightly, but perceptibly, different. 28 ref.

(Turn to page 34)

New Data Revealed On Fundamentals Of Stainless Steels

Reported by John Watson

Metallurgist, Link-Belt Co.

Indianapolis Chapter was privileged to see and hear for the first time much new data on the fundamentals of stainless steels which have been gathered together by Carl A. Zapffe for a "techbook" on "The Story of Stainless Steel" intended for future publication by the A.S.M.

Speaking before the September meeting on "Welding and Applications of Stainless Steels", he sought to clarify and simplify the knowledge of these materials. Figures and tables heretofore unpublished were prominent in his presentation.

After disposing in a most entertaining manner of the historical background, Dr. Zapffe proceeded to discuss the stainless steels on the basis of corrosion and oxidation resistance. Since mechanical abrasion removes the passivity of stainless, static tests will have little meaning when this type of service is encountered, he pointed out. The stabilized grades of austenitic stainless were strongly recommended over nonstabilized grades for corrosion resistance.

The highlight of Dr. Zapffe's talk (for educational purposes) was a breakdown of some hundred alloy modifications into three groups, and the further subdivision of each group into minimum, medium and maximum composition ranges.

Class I represents the hardenable, or martensitic, chromium grades. Class IA contains minimum chromium and carbon content, Class IB includes the cutlery grades, and IC the high-chromium high-carbon series.

Class II comprises the nonhardenable, or ferritic, chromium grades, and is also broken down into A, B and C by alloy content and phase relationships. Class III alloys are the austenitic chromium-nickel grades, with IIIA containing minimum nickel content (the least stable, and hence the most workhardening of the austenitic grades); Class IIIB with increasing nickel content up to roughly 14% to reduce workhardening and create "free-spinning" alloys; and Class IIIC, the more complex austenitic alloys, such as those containing several per cent of molybdenum.

Phenomena underlying the hardening of Class I steels and the low notch-impact strength of Class II steels were illustrated by "fractography"—a microscopic technique of the speaker's invention. Hydrogen embrittlement in pickled and electroplated steel was explained on the basis of a special bend test, also of the speaker's invention.

Dr. Zapffe presented some unusual evidence for a newly conceived slag form of chromium—"chromium protoxide"—which dissociates on cooling, causing free chromium to precipitate, much the same as graphite precipitates on cooling from its high-temperature protoxide, CO. The phenomenon gives rise to inclusions in stainless steel containing visible metallic particles, and to unexpected chemical changes in the reduction of chrome ore. A similar low-sulphur form, the speaker believes, causes a reaction in free-machining Class IA steel (Type 416) which allows corrosion to develop around sulphide inclusions.

Success With Hot Work and Die Steels Reflected in Selection, Heat Treatment

At Left Is H. E. Replogle, Speaker at the September Meeting of the Dayton Chapter, and at Right Stewart DePoy, Chapter Chairman

Reported by H. J. Reindl

Metallurgist, Inland Mfg. Div., G.M.C.

Success in hot work and plastic die steels is often reflected in the selection, use and heat treatment of the steel, H. E. Replogle, manager of toolsteel sales development, Universal-Cyclops Steel Corp., told the Dayton Chapter at its first meeting of the season.

The three main types of steels referred to by Mr. Replogle were plastic die steels, powder metal die steels and hot work steels.

Plastic dies may be made by either cold hubbing or machining, and selection of the proper material for the job is dependent upon operating conditions, design, and previous experience. In the plastic molding field, beryllium-copper dies are showing great promise, especially where the design of the part will permit hubbing of the cavity. Care must be taken, however, to select the proper steel for the master hub, since the molten metal is cast around the hub and pressure is then applied to secure the cavity.

Nitriding of metal dies used in the pressure molding of metal powders preparatory to sintering greatly retards the hollowing-out effect often experienced at high pressure areas.

The problems facing the metallurgist who has to deal with hot work dies are toughness, ability to withstand softening in service, wear resistance and heat or fire checking. The factors influencing these problems are carbon content, alloy content and hardness. Factors favoring one of these problems often produce undesirable effects in another; that is why, Mr. Replogle said, metallurgists get gray!

Recounts Interviews With German Scientists

Reported by G. F. Kappelt

Assistant Metallurgist, Bell Aircraft Corp.

A discussion of experiences, the types of facts, and the types of scientists encountered in American intelligence work in Germany was presented to the members of the Buffalo Chapter by Samuel L. Hoyt, Battelle Memorial Institute, at the October meeting.

Dr. Hoyt, in charge of metallurgy for the ALSOS Mission, was privileged to interview many of the outstanding metallurgical leaders of the German research centers, most of whom were true scientists working for the advancement of science and in the solution of critical materials problems.

Among the many developments which Dr. Hoyt traced down were: the production of nonmagnetic hard rolled stainless steel; steel shell cases; a titanium steel for machine gun barrels; the effect of temperature and alloy composition and structure on the modulus of elasticity; a new theory of true impact or high velocity behavior; and a new general theory of creep and fatigue of metals at high temperatures.

Wanted:
Bits and Pieces

Brief descriptions of interesting or unusual metallurgical procedures will be welcomed by the editor of *Metal Progress* for publication in the "Bits and Pieces" department. Payment is choice of an A.S.M. book for each item published. Notes about plant practice are needed more than items concerning laboratory practice.

Heads New Lindberg Office

Lindberg Engineering Co. of Chicago has announced the opening of a new office in Cleveland. Stuart K. Oliver, formerly metallurgist for General Motors Corp., is being transferred from Lindberg's New York office to take charge of the new branch. Mr. Oliver is a past chairman of the Dayton Chapter.

11-170. Continental Wartime Developments in Spectroscopic Technique. Ernest H. S. Van Someren. *Journal of Scientific Instruments*, v. 24, Sept. 1947, p. 225-230.

Review of apparatus, light sources, technique, methods, and scope.

11-171. Note on a Simple Galvanometer With Negative Feedback. D. K. C. MacDonald. *Journal of Scientific Instruments*, v. 24, Sept. 1947, p. 232-233.

Based on Preston's earlier design of a galvanometer amplifier using a high degree of parallel negative feedback, a simple circuit using series feedback proves most suitable for measurements of small potentials as in metallic conductivity experiments. How the performance equations may be quickly derived for both systems.

11-172. A Twelve-Channel Recorder for Use With Resistance Strain Gages. A. Watson. *Journal of Scientific Instruments*, v. 24, Sept. 1947, p. 239-242.

In the 12-channel system, offbalance voltage is amplified and rectified and the spot deflection on the 12 cathode-ray tubes continuously recorded photographically. Deflections are measured directly from the film with a traveling microscope.

11-173. Instrumentation—Important Chapter of Chevrolet Story. *Instrumentation*, v. 3, 4th Quarter, 1947, p. 8-9.

Described and illustrated.

For additional annotations indexed in other sections, see:
6-255; **8**-154; **13**-48; **24**-347.

116 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

12 INSPECTION AND STANDARDIZATION

12-172. Common-Sense Quality Control. Part I. Ernest L. Fay. *American Machinist*, v. 91, Sept. 25, 1947, p. 76-78.

Application at Waterloo plant of John Deere Co.

12-173. Will That Spring Do Its Job? Clifford W. Kennedy. *American Machinist*, v. 91, Sept. 25, 1947, p. 102-103.

Selection, testing, and quality-control procedures for the manufacturer of devices which utilize springs in their construction.

12-174. Inspection of Pipe-Line Welding by Radiographic Methods. Walter W. Offner. *Oil and Gas Journal*, v. 46, Sept. 20, 1947, p. 180-181.

Methods used in construction of 214-mile, 30-in. line.

12-175. Locating Internal Defects. Benson Carlin. *American Gas Association Monthly*, v. 29, Sept. 1947, p. 391-393.

Use of supersonic reflectoscope as nondestructive tester for flaws hidden as deep as 25 ft. in plant equipment.

12-176. Unification of Screw Threads. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 145-200.

Seven papers related to attempts to establish uniform British-U. S. standards, presented at conferences held in 1945. Also an address, discussions, and communications relative to the same, and a report of addresses and discussion at a special meeting in London on Sept. 6, 1946. Papers are as follows: A review of the recent U.S.-Canadian-U.K. conferences, by S. J. Harley. Pipe threads, by E. G. Saunders and J. E. Sears. Acme screw threads and buttress threads, by L. W. Nickols and J. E. Baty. Instrument threads, by G. A. Whipple, W. O. Davis, and A. D. Snutch. The unification of British and American screw threads, by F. H. Rolt and J. E. Sears. Research on fatigue strength of screw threads of different form, by D. G. Sopwith and T. Settle. Rationalization of screw thread series, by J. E. Sears and W. C. Swift. Addresses were by: Lord Woolton, Arthur Woodburn, William L. Batt and Stanley J. Harley. (War Emergency Issue No. 18.)

12-177. Quality Control of Welds by Means of Gamma Rays. S. T. Nazarov. *Avtogennoe Delo (Welding)*, June 1947, p. 9-12. (In Russian.)

A comparative analysis of two methods for the above, using X and gamma rays, respectively. Despite the high cost of gamma-ray emanating substances, their use is recommended for inspection of thick joints. Methods of inspection used in Russia.

12-178. Reducing Material Costs Through Standardization. H. R. Clauser. *Materials & Methods*, v. 26, Sept. 1947, p. 63-67.

Information contributed by American Standards Assoc., Bell Telephone Laboratories, General Electric Co., General Motors Corp., National Industrial Conference Board, and Westinghouse Electric Corp., is coordinated.

12-179. Precision Measurement. Section II—Instrument Inspection: Part 14—Inspection of Dial Gages and Comparators. Warren Baker. *Machine and Tool Blue Book*, v. 43, Oct. 1947, p. 206, 208, 210-212, 214-216, 218-222, 224, 226.

Theoretical bases and inspection of dial indicators, snap gages, mechanical comparators, reed comparators, electric limit gage, electric comparator, internal comparators, air comparators, optical comparators.

12-180. X-Ray Inspection Promotes Casting Quality Control. E. H. Grimm. *Foundry*, v. 75, Oct. 1947, p. 94-96, 130, 133, 136.

Use of X-ray inspection by Auto Specialties Mfg. Co., St. Joseph, Mich., which specializes in products for the auto industry, chiefly cast-steel crankshafts, malleable-iron castings, and hydraulic and mechanical jacks.

12-181. Beta-Ray Thickness Gage for Sheet Steel. Otto J. M. Smith. *Electronics*, v. 20, Oct. 1947, p. 106-112.

How G-M counters and integrating circuits, responding to absorption of beta rays by steel strip moving over a radiostrontium source, measure thickness over range of 7 to 24 mils. Sheets can be sorted automatically by a mechanical gate after cutting.

12-182. How Statistical Quality Control Is Being Applied at Timken-Detroit Plant. *Automotive Industries*, v. 97, Oct. 1, 1947, p. 29, 64, 67.

Extended to 11 departments and 100 processes, it has produced many good results such as improvement of quality for various reasons and lowering of different cost items.

12-183. An Experiment in the Use of a Standard Limit System. John Loxham. *Institution of Mechanical Engineers Proceedings*, v. 156, Sept. 1947, p. 103-112; discussion, p. 112-125.

Reasons why British industry, for the most part, has failed to use the limit systems recommended by the British Standards Institution. Details of an attempt to use the B.S.I. system.

12-184. "H" Steels: Chemical Composition Ranges. *Metal Progress*, v. 52, Oct. 1947, p. 576-B.

June 1947 revision of composition limits for S.A.E. and A.I.S.I. steels (electric furnace or openhearth bars, billets, or blooms).

12-185. Exposure Chart for Radium Radiography. Herbert R. Isenburger. *Metal Progress*, v. 52, Oct. 1947, p. 640.

12-186. Personal Equation of Men and Machines. John R. Parks. *Tool Engineer*, v. 19, Oct. 1947, p. 43-45.

Men as well as machines have personal equations as far as precision of measurements is concerned. How this fact should be applied to inspection and quality control procedures.

12-187. Involute Checking Machine for Large Helical Gears. D. W. Dudley. *Machinery*, v. 54, Oct. 1947, p. 142-145.

New machine and results obtained with it, which are much more accurate than those obtained by visual inspection.

12-188. Common-Sense Quality Control. Part II. Earnest L. Fay. *American Machinist*, v. 91, Oct. 9, 1947, p. 110-113.

Methods used at Waterloo plant of John Deere Tractor Co.

12-189. Supersonic Examination of Materials. Benson Carlin. *Product Engineering*, v. 18, Oct. 1947, p. 113-118.

Outstanding characteristics of supersonic waves above 20,000 cycles and their use for detecting and locating flaws in metals and plastics.

12-190. Quality Control at Servel, Inc. Douglas M. Considine. *Instrumentation*, v. 3, 4th Quarter, 1947, p. 3-7.

Procedures in gas-refrigerator manufacture.

12-191. Importance of Standardizing Specifications for Engineering Materials. Benjamin Melnitsky. *Steel*, v. 121, Oct. 20, 1947, p. 106, 127.

Purpose of specifications, simplification of fabrication, keeping information up-to-date.

12-192. Standardization of the Radiographic Examination of Welded Joints in Mild Steel Pressure Vessels. *Transactions of the Institute of Welding, (B.W.R.A. Supplement)*, v. 10, Aug. 1947, p. 16-20.

Recommendations of the FE.6 committee.

12-193. A New Method of Nondestructive Spot Weld Testing for Stainless Steels. A. M. Armour. *Metallurgia*, v. 36, Sept. 1947, p. 273-275.

New method is claimed to be quick, simple, and reliable. This new inspection technique uses a plastic cell containing a fluid in which are suspended magnetic particles.

12-194. Radiography in the Die Casting Industry. R. W. Dively. *Industrial Radiography & Non-Destructive Testing*, v. 6, Summer 1947, p. 20-21, 39.

Procedures for revealing defects.

12-195. Absorption Measurements for Broad Beams of 1 Millivolt and 2 Millivolt X-Rays. G. Singer, C. B. Braestrup, and H. O. Wyckoff. *Industrial Radiography & Non-Destructive Testing*, v. 6, Summer 1947, p. 22-24.

Experimental data on absorption of X-rays in concrete for wide-angle beams generated by voltages of 1 and 2 millivolts; preliminary data on the variation of the dosage rate with the distance from a protective barrier; and data on concrete protection requirements for 1 and 2 millivolt radiation under certain industrial conditions.

For additional annotations indexed in other sections, see:
11-148-149; **14**-278-283; **19**-323-342; **22**-599; **24**-331; **27**-222-225.

Economy Governs Size of Commercial Aircraft—Furnas

Reported by A. Justus Larson

Assistant Metallurgist
Eastman Kodak Co.

Future trends in commercial, private and military aircraft were outlined before the Rochester Chapter ⚙ on Oct. 13 by Clifford Cook Furnas, director of Cornell Aeronautical Laboratory.

In commercial aircraft, according to Dr. Furnas, optimum size is not entirely an engineering problem, but is governed primarily by economy of operation. Planes of the Douglas DC-4 (50-passenger) type will continue as the most widely used size category. Transoceanic service can operate most economically if planes carry 100 passengers.

High-speed transportation is dependent primarily on how much the public wants to pay. The optimum speed (governed by economy) is 250 to 300 miles per hr. However, speeds up to 500 miles per hr. may be realized by building more powerful engines. Above this, planes must be jet propelled. Jet propulsion, however, will be limited to military service during the next ten years because of the high cost of jet plane operation.

In 1940 the commercial airlines with 335 aircraft of the DC-3 type flew approximately one billion passenger miles. In that same year it took 7500 Pullman cars to handle seven billion passenger miles. With an estimated 900% increase in air traffic by 1950 (as compared to 1940), it is predicted that 575 aircraft of the larger types can satisfactorily handle this increase in air traffic. Today there are 650 aircraft available.

As to private planes, although they have increased in number from 25,000 before the war to 50,000 at the present time, this number is not expected to increase materially in the immediate future because of high cost, lack of airport facilities, and adverse weather conditions. A promising future for the helicopter is evident because of its independence of airports and ideal weather conditions.

The speed with which modern military aircraft are being developed can best be realized by the fact that all combat planes used in World War II are now obsolete. While the imminence of "pushbutton warfare" has been exaggerated, its vicious potentialities are great. Automatic control is now a reality, as are radar release for bombing, jet propulsion for speeds up to 750 miles per hr., and infrared heat rays in conjunction with radar to replace human eyes, muscles, and brains.

Satellite missiles to operate 500 miles above the earth's atmosphere and stay suspended are in the drafting-room stage. Controlled rockets with speeds in excess of 3600 miles per hr. are dependent upon the engineer to furnish better high-temperature alloys or alloys combined with ceramics to withstand the extreme heat associated with such high speeds.

Dr. Furnas stressed the point that the money and effort now being expended could be justified if a solution to international problems could be obtained or if commercial aircraft would benefit as they have in the past.

Peoria Names New Vice-Chairman

Peoria Chapter ⚙ has appointed a new vice-chairman to take the place of N. Dirks, who has recently moved to Chicago. W. J. Bornholdt, the new vice-chairman, was selected as a candidate by the Nominating Committee, and elected by unanimous agreement of the Executive Committee. He is a metallographer with Caterpillar Tractor Co.

Powder Metallurgy Consultant

Robert Talmage ⚙ of Norwalk, Conn., has recently organized a consultation business in powder metallurgy. His specialty is the application, design, installation and operation of equipment to produce parts from metal powders, as well as development work on new materials. Mr. Talmage was formerly a partner in Copress Corp.

13 PYROMETRY
Temperature Control

13-44. The "Why" of Bimetal Thermometers. A. H. Lamb. *Power Plant Engineering*, v. 51, Sept. 1947, p. 90-92.

Development of the present instruments, selection of alloys; fabrication procedures.

13-45. Selecting and Installing Thermocouple Leadwires. C. C. Roberts and C. A. Vogelsang. *Power Plant Engineering*, v. 51, Sept. 1947, p. 110-112, 124.

13-46. The Selection of Thermocouple Extension Lead Wire. C. C. Roberts and C. A. Vogelsang. *Steel Processing*, v. 33, Sept. 1947, p. 568-571.

13-47. A Fundamental Improvement in Temperature Measurement and Control. Hans W. Bluethe. *Metal Progress*, v. 52, Oct. 1947, p. 591-593.

How invention of an electronic circuit actuated by movement of a small metal vane in a high-frequency electrical field facilitated operation of control valves and switches by measuring instruments.

13-48. Installation and Use of Instruments on Openhearth Melting Furnaces. R. C. Baker. *Journal of the Iron and Steel Institute*, v. 157, Sept. 1947, p. 81-88.

The installation and development of recording and control instruments for routine use in a small openhearth plant. Recording of furnace-roof temperature and gas and air flows on one chart and an experimental automatic crown-temperature control.

13-49. Measuring and Recording Dew Point Temperatures of Industrial Gases. Nelson Gildersleeve. *Instrumentation*, v. 3, 4th Quarter, 1947, p. 12-14.

Instruments and procedures. Applications to miscellaneous processes, including heat treating.

For additional annotations indexed in other sections, see:
3-338.

14 FOUNDRY PRACTICE

14-274. Casting Magnesium in Metal Molds. Herbert Chase. *Iron Age*, v. 160, Sept. 25, 1947, p. 73-76.

Method used at the Teterboro plant of Bendix Aviation Corp. in producing parts as die castings and in permanent and semipermanent molds. A magnesium die-casting alloy featuring improved ductility and impact strength.

14-275. Foundry Sand Reclamation. J. M. Cummings and W. M. Armstrong. *Canadian Institute of Mining and Metallurgy Transactions* (bound with *Canadian Mining and Metallurgical Bulletin*), v. 50, Aug. 1947, p. 448-459.

Several different methods. Development of an economic process for British Columbia, where sand has to be shipped in to sell at $11 to $12 per ton. Flow sheet for proposed scheme for small foundries.

14-276. The Production of Die Castings for Ford Carburetors. Herbert Chase. *Machinery (London)*, v. 71, Aug. 28, 1947, p. 242-246.

Methods used by Ford Motor Co.

14-277. Counter-Gravity Casting Saves Scrap and Metal. *American Machinist*, v. 91, Sept. 25, 1947, p. 81.

A new process developed at Armour Research Foundation cuts the number of defects attributable to slag, reduces to a minimum defects from mold sand, lowers greatly the number of defectives caused by pinholes or porosity, allows successful production of castings with thinner sections than those obtainable by conventional techniques, and appreciably increases the yield from the metal used.

14-278. Surface Quality of Die Castings. A. L. Sundwick. *American Machinist*, v. 91, Sept. 25, 1947, p. 127, 129, 131.

A study of a number of A.S.T.M. Alloy XXV castings to determine the reasons for poor surface quality. Radiographs disclosed that there is no strict correlation of porosity with surface imperfections. Causes of chills, splashes, soldering or fusing, gatehole defects, and cold-laps; recommendations for their avoidance.

14-279. Remèdes Préconisés Pour Eviter les Porosités dans les Pièces Moulées en Fonte. (Remedies Suggested for Avoiding Porosity of Iron Castings.) Gabriel Joly. *Fonderie*, June 18, 1947, p. 692-693.

Causes of porosity; the chemical composition of good cast iron; suggested mixtures for cupola furnaces.

14-280. Holding Loose Pieces. *Foundry Trade Journal*, v. 82, Aug. 28, 1947, p. 396.

Method for holding loose pieces in their correct position while the core is being made and also to allow easy and quick release from the corebox before withdrawing the core.

14-281. Iron Alloy Melting Practice in a New England Foundry. Arthur Q. Smith. *Industrial Gas*, v. 26, Sept. 1947, p. 13-14, 34.

14-282. Nonferrous Foundry Practice. W. G. Mochrie. *Metal Industry*, v. 71, Sept. 5, 1947, p. 203-205.

Recent advancements. 19 ref. (To be concluded.)

14-283. Kontrola Jakosti Pri Seriove Vyrobe Odlitku z Lehkych Slitin. (Quality Control in Mass Production of Light-Alloy Castings.) Jiri Mackievic. *Hutnické Listy*, v. 1, Oct. 1946, p. 79-83.

A recommended visual inspection for the furnaceman. A series of test pieces are obtained by casting at temperature intervals between 660 and 880° C. Observation of the structure visible on breaking the pieces indicates the suitability of the metal.

14-284. Problem Odstranovani Nalitku ve Slevarnach. (Problem of Removal of Risers From Foundry Castings.) Jiri Mackievic. *Hutnické Listy*, v. 1, Dec. 1946, p. 121-129.

New method used in U.S.S.R. since 1941. A special plain core with a central opening whereby the riser is connected to the casting by a thin neck which can be readily broken-off mechanically is placed in the mold between the riser and casting. Results obtained in the U. S. and Czechoslovakia with different metals.

14-285. Syntetické Pisky pro liti Ocelove Litiny na Syrovo. (Synthetic Binders for Greensand Molds for Steel Castings.) Bretislav Picman. *Hutnické Listy*, v. 1, Jan. 1947, p. 151-155.

The use of bentonite as a binder. Its advantages and preparation of these sands.

14-286. Je Formovani do Kremiciteho Pisku s Prisadou Cementu Rentabilni? (Does Molding With Silica Sand With a Cement Binder Pay?) Jos. Vorlicek. *Hutnické Listy*, v. 1, March 1947, p. 200-202; April 1947, p. 220-224.

The advantages and disadvantages of the above, which the author has introduced in his foundry for all castings weighing over 80 kg. Cost of cleaning castings was reduced about 19% during the first year; further savings are expected in the future.

14-287. Spendlikove Pory u Ocelovych Odlitku. (Pinholes in Steel Castings.) J. Mackievic. *Hutnické Listy*, v. 1, May 1947, p. 245-249; June 1947, p. 273-276.

Experiments indicate that pinholes are caused by nascent hydrogen formed by decomposition of mold moisture on pouring of the hot metal into a greensand mold. the hydrogen being absorbed by the surface layer of the casting. Recommends complete deoxidation of the molten metal before pouring, preferably with aluminum.

14-288. Molding Machines. E. A. Blake. *American Foundryman*, v. 12, Sept. 1947, p. 31-35.

Advantages and disadvantages of the various types.

14-289. Foundry Coke Quality Effect on Cupola Melting. D. E. Krause. *American Foundryman*, v. 12, Sept. 1947, p. 44-49.

Objective of this discussion is not to set up standards for coke quality or to consider the various factors that may affect the quality of coke. Its prime purpose is to indicate what may be expected in cupola operation with a change in coke quality and, also, what may be done in order to get the best results out of the coke available. (Presented at 51st Annual Meeting, American Foundrymen's Assoc., Detroit, April 29, 1947.)

14-290. Making Rolls. *Western Metals*, v. 5, Sept. 1947, p. 18-19.

Importance of well-made rolls. Casting and cooling of the rolls.

14-291. Discussion on Some Notes on Feeding. *Foundry Trade Journal*, v. 83, Sept. 4, 1947, p. 3-6.

Discussion of paper by S. L. Finch (July 31 and Aug. 7 issues) on practical and theoretical aspects of the feeding of steel castings.

14-292. Nonferrous Foundry Practice. (Concluded.) W. G. Mochrie. *Metal Industry*, v. 71, Sept. 12, 1947, p. 223-224.

New equipment, methods, die-casting techniques, reclamation policies applied to production of nonferrous art founding and instrument founding.

14-293. Automatic Molding Machine. *Metal Industry*, v. 71, Sept. 19, 1947, p. 249.

New development in foundry mechanization.

14-294. New Coreroom is Model of Efficiency. Pat Dwyer. *Foundry*, v. 75, Oct. 1947, p. 66-71, 130.

Layout and procedures in new core-making department of Cleveland Foundry Co., Cleveland.

14-295. Effect of Chills on Rate of Solidification of Gun Metal. William J. Richmond. *Foundry*, v. 75, Oct. 1947, p. 72-73, 252, 254, 256.

Results of an investigation of the effect of sand, steel, carbon, and graphite as mold materials on the rate of solidification of gun metal (88% Cu, 8% Sn, and 4% Zn).

14-296. Control of Grain Size in Magnesium Casting Alloys. Vernon C. F. Holm and A. I. Krynitsky. *Foundry*, v. 75, Oct. 1947, p. 81, 228, 230, 232, 234, 236, 238, 240.

New procedure developed at Bureau of Standards in which the molten alloy is treated with lump magnesite.

(Turn to page 38)

Rose Warns of Impurities Introduced With Copper Additions to Cast Iron

Reported by C. G. Atchinson

Assistant Chief Metallurgist
Sheffield Steel Corp.

Copper to the extent of 1% is becoming an important alloy addition to increase the tensile and other mechanical properties of cast iron, members of the Kansas City Chapter ⊕ learned at the first dinner meeting of the season held on Sept. 17. "Effect of Impurities in Cast Iron Introduced by Copper Additions" was the subject of the address by K. E. Rose, chairman of the department of mining and metallurgy at Kansas University. Mr. Rose pointed out that because of the uncertainty as to the effect of the common contaminants present in scrap copper, most additions to cast iron are made as pure copper.

Mr. Rose told how the effects of a contaminating element on such properties as transverse strength, deflection, chill depth and tensile strength were determined by adding individual elements along with pure copper to a series of cast iron melts made in a 27-in. cupola. Statistical methods (principally analysis of variance) provided a measurement of the interrelated effects or interactions. The permissible percentages of contaminants that can be added with copper to gray cast iron are:

Aluminum	0.1% max.
Antimony	0.1 max.
Arsenic	0.1 max.
Beryllium	Probably above 0.02
Bismuth	0.001 max.
Cadmium	0.005 max.
Lead	0.005 max.
Tellurium	0.001 max.
Tin	0.01 max.
Zinc	0.1 max.

Both lead and zinc (the commonest constituents of copper-base alloys) are potential sources of trouble when their alloys with copper are employed as ladle additions. •More than 0.1% tellurium in a copper addition might cause excessive chill, but should not affect the other properties. No other elements are likely to be present in harmful amounts.

Snapped at the September Meeting of the Kansas City Chapter Are K. E. Rose of Kansas University, the Speaker, and Henry Deterding, Vice-Chairman of the Chapter

Bismuth appears to be distinctly harmful to the mechanical properties of gray cast iron. It is not ordinarily introduced in copper alloys, but might be associated with alloy scrap in the form of solders or bearing metals.

Lead might pass through the melting furnace in quantities large enough to be harmful. However, it is probable that none of the other nine elements would be retained in harmful amounts if they were melted down with the charge.

Wheeler Consultancy Expands

Jack W. Wheeler ⊕, president and chief consultant of the Wheeler Consultancy of Springfield, Mass. (specialists in permanent mold design and manufacture), announces the expansion of the organization's activities including its reorganization as a corporation. Activities now cover mold design, manufacture and breaking-in, and a department concerned with industrial styling and product design for light alloy equipment. The new corporation is also manufacturing the E. Z. Coat mold dressing and foundry supplies.

High-Purity Powders Required for Bearings

Reported by Clyde R. St. John

Metallurgical Engineer
Permanente Metals Corp.

Powder metal bearings and their application as machine parts was the subject presented by A. J. Langhammer, president of the Chrysler Corp., Amplex Division, before the Sept. 22 meeting of the Inland Empire Chapter. Mr. Langhammer was accompanied by Leon Printz, his chief metallurgist, and William Truesdell, Industrial Products Co., Seattle distributors for Amplex.

He described the progressive steps in the production of Chrysler's Oilite bearings, stressing the importance of having high-purity powders. A unique method is used for final sizing after sintering, by pressing with special tools; complex shapes can be manufactured in a few seconds, and machining is not necessary.

Oil-impregnated bearings can be used with extremely low clearances, and will stand up under severe shock and impact loads. They will outwear solid bearings if the proper type is used for the job.

Mr. Langhammer also described his experience hunting antelope by automobile, and promised to make good use of the advice tendered by Chapter Chairman Walter Davis on how to hunt deer by sitting on a log.

PLEASE NOTE!

NAMES AND ADDRESSES of the magazines and journals annotated in the Review of Current Metal Literature are available in list form from ASM headquarters. Use this list if you wish to secure a copy of any original article, and write direct to the source. Copies of the address list may be secured free of charge by writing to Metals Review, 7301 Euclid Ave., Cleveland 3, O.

Results obtained when magnesium alloy melts are superheated, treated with solid carbonaceous materials, with carbon monoxide, or with lump magnesite.

14-297. Effect of Mold Material on Gas Absorption by 85-5-5-5 Alloy. L. W. Eastwood and J. G. Kura. *Foundry*, v. 75, Oct. 1947, p. 86-91, 156, 158, 160, 162.

Effect of moisture content in natural sand; effect of A.F.A. permeability; and effect of baking temperature and type of bond. Natural greensand compared with other mold materials and effect of mold materials on properties of 85-5-5-5 alloy in the horizontal ⅛-in. web Webbert test bar.

14-298. Experience Can Point Way to Better Castings. Clyde L. Frear. *Foundry*, v. 75, Oct. 1947, p. 92-93, 206, 208, 210, 212, 214, 216, 218, 220.

Lessons learned in war production which can be applied to present-day problems.

14-299. Sand Control. G. W. Anselman. *Foundry*, v. 75, Oct. 1947, p. 97, 164, 166, 168, 170, 172.

Factors involved in the selection of the proper sands, clays, and other molding materials.

14-300. Report on Die Casting. Thomas A. Dickinson. *Tool Engineer*, v. 19, Oct. 1947, p. 23-28.

Principles of hot and cold chamber methods.

14-301. Copperspun Squirrel-Cage Rotor. G. R. Anderson. *Electrical Engineering*, v. 66, Oct. 1947, p. 980-982.

The name "Copperspun" describes a one-piece squirrel-cage rotor centrifugally cast of copper. Salient features are high strength, high melting point, no joints, low coefficient of expansion, high conductivity, low porosity, and improved dynamic balance.

14-302. Recent Developments in Metals and Their Processing. W. F. Craig, Jr., R. A. Lubker, and W. E. Mahin. *Machine Design*, v. 19, Oct. 1947, p. 71-78.

Reviews H-steels, boron in steel, developments in stainless and tool-steels; secondary aluminum, new magnesium and copper alloys, high-temperature alloys; use of castings and developments in centrifugal, permanent mold and precision casting; new welding advances and brazing of aluminum; powder metallurgy.

14-303. Iron Foundry Advances in the Chicago Area. H. Kenneth Briggs. *Metal Progress*, v. 52, Oct. 1947, p. 578-580.

Outstanding achievements of the last decade include improved melting equipment, new combinations of furnaces for continuous melting, close control of carbon.

14-304. A Revolution in the Bronze Foundries. J. D. Zaiser. *Metal Progress*, v. 52, Oct. 1947, p. 603-605.

Developments of the past 30 years.

14-305. Thirty Years in Steel Founding. H. W. Maack. *Metal Progress*, v. 52, Oct. 1947, p. 631-635.

The 30-year history of this industry particularly in relation to a steel foundry producing castings for valves and fittings. Melting, casting, heat treatment, mechanical handling, and inspection procedures, and a research foundry.

14-306. Brass Foundry Practice at Crane Co. H. M. St. John. *Metal Progress*, v. 52, Oct. 1947, p. 636-639.

Improvements in foundry practice including furnaces, pouring temperature control, mechanical conveying, specifications of materials and salvage.

14-307. Role of Centrifugal Casting in Transforming Pigs to Pipe. Gerald Eldridge Stedman. *Steel*, v. 121, Oct. 13, 1947, p. 90-92, 94, 122, 124.

Manufacturing procedure for producing 3-in. to 24-in. cast-iron pipe, 18 ft. long, from pig iron and scrap to hydrostatically tested finished product.

14-308. The Influence of Production Flow on Molding Methods in Iron Foundries and Its Effect on P.M.H. and General Efficiency. R. C. Shepherd. *Foundry Trade Journal*, v. 83, Sept. 11, 1947, p. 21-30, 33; Sept. 18, 1947, p. 43-51; Sept. 25, 1947, p. 67-74.

The need for giving immediate consideration to the use of improved molding methods. A greater use of production-flow methods in molding shops is advocated. Some effects of production-flow operation on various aspects of molding work. Details of recommended materials-handling procedures. (Presented at Nottingham Conference of Institute of British Foundrymen.)

14-309. Pattern Construction. *Foundry Trade Journal*, v. 83, Sept. 25, 1947, p. 66.

Improved construction for bracket pattern to avoid warping and splitting of the wood.

14-310. The Piel and Adey Gravity Die Casting Process. *Machinery (London)*, v. 71, Sept. 25, 1947, p. 356-357.

Technique used by the German firm of Piel and Adey for thin-walled components in copper-base alloys. Essentials were use of highly fluid brasses containing substantial additions of aluminum, tilting of the mold about its lower edge while pouring, vibration of the mold, and use of a specified die dressing. (From B.I.O.S. Final Report No. 649, Item No. 21.)

For additional annotations indexed in other sections, see: 2-238; 3-300-311; 10-168; 18-215; 23-396-412.

15 SALVAGE AND SECONDARY METALS

15-34. Profitable Impalpable. *Industrial and Engineering Chemistry*, v. 39, Sept. 1947, p. 8A, 10A, 14A, 16A.

Acid-solution process recently brought into production for converting machine-shop steel scrap into high-purity powdered iron.

15-35. Reclaiming a Broken 54-In. Mill Pinion. Warren W. Scherer. *Iron and Steel Engineer*, v. 24, Sept. 1947, p. 58-61; discussion, p. 61.

Methods used. (Presented at A.I.S.E. Pittsburgh District Section Meeting, April 14, 1947.)

15-36. Purification of Aluminum and Its Alloys. Yves Dardel. *Metals Technology*, v. 14, Sept. 1947, T.P. 2247, 20 p.

A critical discussion of the literature on the remelting and purification of aluminum scrap. States that most of the papers on the subject have no scientific value because of the use of theories opposed to fundamental laws of physical chemistry. Therefore, a general theory is developed for the different basic processes used. Under "elimination of dissolved hydrogen", 9 elementary processes are discussed; and under "removal of insoluble impurities", 4 methods are evaluated. Actual commercial methods are much more numerous, but consist of different combinations of the steps discussed. 57 ref.

15-37. Smelting and Refining of Reclaimed Nonferrous Metals. A. E. St. John. *Metal Progress*, v. 52, Oct. 1947, p. 609-612.

Equipment and procedures used by Federated Metals Division, American Smelting and Refining Co.

15-38. A Mechanical Method for Machine Repair. T. O. Oliver, Jr. *Iron and Steel Engineer*, v. 24, Sept. 1947, p. 55-57; discussion, p. 57-58.

New method for repairing castings which enables repairs to be made without distortion and without patches. Specially formed locks or keys are used to splice the cracks. Slots are cut transverse to the fracture and the locks are inlaid by cold working into the parent metal. At points of high stress concentration, an inlay of high-strength alloy plates may be used. These are held in place by dowels cold worked into matching half holes between the parent metal and the lock. (Presented at A.I.S.E. Buffalo District Section Meeting, April 9, 1946.)

15-39. Scrap Reduction Gains Recognition. James K. Matter. *American Machinist*, v. 91, Oct. 9, 1947, p. 114-115.

Cost reduction through scrap reduction.

15-40. Weld Repair of Gray Iron Castings. C. E. Phillips. *Iron Age*, v. 160, Oct. 23, 1947, p. 49-51.

How to produce fully machinable welds in the above. Types of electrodes best suited for this type of work and the techniques necessary to avoid excessive hardness and breakdown of edges or corners.

For additional annotations indexed in other sections, see: 7-387.

16 FURNACES AND FUELS

16-116. Electronic Frequency Converters for Induction Melting Furnaces. S. R. Durand. *Iron Age*, v. 160, Sept. 25, 1947, p. 64-67, 134.

Several furnace installations employing this type of power conversion for melting both alloy steels and nonferrous alloys. An installation for holding molten steel at constant temperature for continuous casting. Some notes on the installation of lining for high-frequency melting furnaces with mercury arc power converters.

16-117. Adaptation du Principe du Chargement Automatique des Cubilots a une Installation Existante. (Adaptation to an Existing Installation of the Automatic Charging Principle for Cupola Furnaces.) Roger Lesage. *Fonderie*, June 18, 1947, p. 694-696.

Apparatus for automatic charging of two cupola furnaces.

16-118. Radio Frequency Heating—What It Is and How It Works. B. E. Rector. *Better Enameling*, v. 18, Sept. 1947, p. 15-18.

Various applications.

16-119. Consolidated Vultee Reconversion Features Gas Fuel. Gerald Eldridge Stedman. *Industrial Gas*, v. 26, Sept. 1947, p. 7-9.

Use of gas-fired ovens for baking of finishes on various products which

(Turn to page 40)

Thum Urges All To Study Uses Of Atomic Energy

Reported by **A. C. Montgomery**
Manitoba Steel Foundries, Ltd.
and **W. J. Notley**
Canadian National Railways

Education among all groups and organizations, for persons of every age, on the possibilities of atomic energy for the good of mankind was strongly advocated by Ernest E. Thum, editor of *Metal Progress*, speaking before the Manitoba Chapter on Sept. 9. The chapter acted as hosts to the Engineering Institute of Canada and the Professional Engineers of Manitoba. The speaker was introduced by the Honorable J. S. McDiarmid, Minister of Mines and Natural Resources for the Province of Manitoba, and P. E. Lamoureux, chairman of the chapter.

This new atomic age is a problem for the coming generation, Mr. Thum said, and it is the responsibility of us all to bring into every walk of life the realization of atomic energy. Through the thorough knowledge of these possibilities, the common people—and in turn their representatives in government—will wield a mighty force for good in the use of the new discovery.

Mr. Thum traced the growth of industrial energy from early steam power to the not too distant future, when atomic energy will eventually take over as a source of fuel. This, he stated, will take place in the next generation, and since atomic energy is controlled through government agencies, he foresees a transition period, during which the government will nationalize all sources of power.

As an example of the availability of uranium for the production of atomic power, Mr. Thum compared world supplies of coal, oil and uranium in relation to their equivalent in days of radiation equal to that reaching the earth from the sun. The world's total supply of coal would equal fifteen days' radiation from the sun; oil would equal five days; while uranium would equal 30,000 years!

The cost of producing energy from an atomic power plant would not be exorbitant. Today a plant of this kind is estimated to deliver power at a cost of 80 cents per kw-hr. A steam power plant in an industrial region near coal costing $3.50 at pit mouth and $7.00 a ton at the furnace today only delivers power at 65 cents per kw-hr.

Already medical science and agriculture are making tremendous strides in the use of radioactive elements. Advantages gained in these sciences would, within a very few years, pay many times the Government's atomic energy research costs.

Touching briefly on the subject of the atomic bomb, Mr. Thum stated that the English-speaking nations should continue to collaborate on atomic research. It is estimated that Russia's development of atomic power is comparable to that of the combined efforts of Canada, Britain and the United States as of ten years ago.

Hruska Opens Welding Service

John H. Hruska has started a consulting service specializing in metallurgical and welding problems, with office and laboratory in Hinsdale, Ill. Until recently Mr. Hruska was director of tests and inspection for Electro-Motive Division of General Motors Corp. During the war, he served as a member of the Ferrous Metallurgy Advisory Board, Committee on Welding of Armor.

Film Illustrates Aluminum

Reported by **Henry Hauseman**
Metallurgist, LaPlant Choate Mfg. Co.

A film entitled "This Is Aluminum" preceded a discussion accompanied by slides on "Aluminum Alloys—Fabrication and Application" before the first fall meeting of the Cedar Rapids Chapter on Sept. 9. Walter E. Sicha of the Cleveland Research Division of the Aluminum Co. of America presented the program. His talk centered on aluminum alloy castings—their physical properties, characteristics and usages. He also covered methods of production and improvements developed in the last decade.

have replaced the airplanes produced during the war.

16-120. Role of Convection in Medium Temperature Processing; With Special Reference to Its Influence on the Design of "Infra-Red" Ovens. Part III. (Concluded.) J. B. Carne. *Industrial Gas*, v. 26, Sept. 1947, p. 15-17, 26-29.

New determinations of the coefficients of natural convection of spheres and vertical plates and influence of convective loss on the design and operation of infrared equipment. 16 ref.

16-121. Some Features of Openhearth Furnace Design. Part I. G. Reginald Bashforth. *British Steelmaker*, v. 13, Sept. 1947, p. 446-454.

An extensive discussion and review of recently published information. 10 ref. (To be continued.)

16-122. The Use of Anthracite as Cupola Fuel. C. C. Wright. *Transactions of the Fifth Annual Anthracite Conference of Lehigh University*, 1947, p. 123-154.

Various factors used to evaluate fuel performance in the cupola. Results of experimental investigation. Almost 100 tests, using a 36-in. cupola with intermittent taps and heats up to 10 tons.

16-123. Electric Salt Bath Furnaces Do Complete Commercial Heat Treating Job. *Modern Machine Shop*, v. 20, Oct. 1947, p. 184, 186, 188, 190, 192.

Furnaces are capable of doing any type of heat treating job, on any shape, with cleanliness and accuracy.

16-124. Investigation of the Collection of Liquid Slag in an Experimental Furnace. U. L. Marshak. *Engineers' Digest (American Edition)*, v. 4, Sept. 1947, p. 420-422.

Experimental equipment for slag collecting. Efficiency is charted versus velocity of flame impingement upon the slag bottom, Froude number, and initial ash concentration of the gases. Certain principles for application to the design of full-size furnaces are deduced, and applied to the construction of these furnaces. (Translated and condensed from *Izvestya Vsesoyuznoga Teplotechnicheskogo Instituta*, v. 16, no. 3, 1947, p. 18-26.)

16-125. A Lead Melting Furnace. *Engineer*, v. 184, Sept. 12, 1947, p. 255.

Furnace built by British firm has a capacity of 7000 lbs. per hr., when loaded in batches of 1800 lb. each.

16-126. Dielectric Heating. B. E. Rector. *Product Engineering*, v. 18, Oct. 1947, p. 158-162.

Six factors which should be considered in determining whether or not use of dielectric heating will be profitable and desirable for a given application. Characteristics of dielectric materials.

16-127. 30 Years' Advance in the Basic Openhearth. J. J. Golden and M. F. Yarotsky. *Metal Progress*, v. 52, Oct. 1947, p. 572-577.

Improvements in refractories, instrumentation, metallurgical control, use of oxygen, pit and mill practice.

16-128. Development of Furnaces With Recirculating Atmospheres. John Ade. *Metal Progress*, v. 52, Oct. 1947, p. 594-598.

The development of various types of furnaces in which the hot atmosphere is circulated at speeds on the order of 100 miles per hour, and the most recent improvement by which this circulation is reversed in direction at fairly frequent intervals.

16-129. New Developments in Industrial Furnaces and Ovens. *American Gas Association Proceedings*, 1946, p. 253-268.

A panel discussion presented by representatives of five manufacturers of industrial furnaces and ovens. Oven vs. furnace construction for temperatures up to 1200° F., by Herman Gehnrich. Recirculation as applied to heating and cooling of industrial ovens, by Richard J. Ruff. Prepared furnace atmospheres, by Charles E. Thomas. Continuous heating and heat treatment of bar stock and tubing, by Frederic O. Hess. Radiant tubes, by W. M. Hepburn.

16-130. "Infrared" Heating by Gas—Its Development and Practice Today. J. B. Carne. *Metallurgia*, v. 36, Sept. 1947, p. 245-249.

Concluded.

16-131. The Role of Convection in Medium Temperature Processing With Special Reference to Its Influence on the Design of "Infrared" Ovens. J. B. Carne. *Fuel in Science and Practice*, v. 26, July-Aug. 1947, p. 90-101.

16 references. (Presented at Annual Meeting of A.S.M.E., New York, Dec. 2 to 6, 1946.)

16-132. Selector Chart for Induction Heating and Melting Equipment. *Iron Age*, v. 160, Oct. 16, 1947, p. 139.

Chart was prepared by Ajax Electrothermic Corp., Trenton, N. J., and is based on engineering data collected since the first applications of high frequency heating and melting in 1916.

16-133. Blast Furnacemen Stress Importance of Sound Hearth Construction. John D. Knox. *Steel*, v. 121, Oct. 20, 1947, p. 102, 105.

Proceedings of joint meeting of the Blast Furnace & Coke Association of the Chicago District and the Eastern States Blast Furnace & Coke Oven Assoc., Cleveland, Oct. 10.

For additional annotations indexed in other sections, see:
2-249-251; **18**-214; **27**-218.

17 REFRACTORIES Furnace Materials

17-85. Eigenschappen en Toepassingen Van Vuurvast Materiaal. (Characteristics and Properties of Refractory Material.) G. Van Gijn. *Metalen*, v. 1, Aug. 1947, p. 217-224.

Various factors affecting refractory material, and desired properties for resistance to attack. Examination is made of the suitability of individual refractory materials when used in the foundry.

17-86. Special Refractories. William H. Henson. *Refractories Journal*, v. 23, Sept. 1947, p. 326-337.

Reprinted from *American Foundryman*, May 1947. (Item 17-53.)

For additional annotations indexed in other sections, see:
2-249-251.

18 HEAT TREATMENT

18-200. Spray Quench Speeds Induction Hardening. Frank W. Curtis. *American Machinist*, v. 91, Sept. 25, 1947, p. 79-81.

Seven typical setups illustrate automatic cycling of heating and quenching.

18-201. Warmtebehandeling van Kettingen. (Heat Treatment of Chains.) M. G. Van der Steeg. *Metalen*, v. 1, July 1947, p. 207-209.

Experience and literature data indicate that the critical temperature should not be exceeded if the carbon content is less than 0.2%. This precaution need not be observed if the carbon content exceeds 0.2%.

18-202. Bright Annealing of Brass. *Metal Industry*, v. 71, Sept. 5, 1947, p. 206.

Methods for retaining surface finish.

18-203. Nitridovani Nastroju z Rychlorezne Oceli. (Nitriding of Tools.) Josef Dasik. *Hutnické Listy*, v. 1, Nov. 1946, p. 101-108.

Results of a study of the dependence of depth and hardness of the nitrided layer on the duration of the nitriding process and of the influence of nitriding on durability of the tool. Qualities required of the nitriding salt and personal experiences in using nitrided tools.

18-204. Nomograph for Determination of the Hardness of Steel From Heat-Treating Data. A. P. Guliaev. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 888-889. (In Russian.)

The variables of time of annealing, per cent carbon, temperature of annealing, and Rockwell hardness are coordinated.

18-205. Quenching of 75S Aluminum Alloy. W. L. Fink and L. A. Willey. *Metals Technology*, v. 14, Aug. 1947, T.P. 2225, 13 p.

Investigations reveal the most critical range of temperature and the effects of quenching sheet and extrusions at different rates through that temperature range, on tensile properties and resistance to corrosion. (Presented at Chicago Meeting of A.I.M.E., Oct. 1946.)

18-206. Liquid Carburizing of Sintered Steels. George Stern and Jesse Greenberg. *Powder Metallurgy Bulletin*, v. 2, Sept. 1947, p. 85-89.

Results of a study of the nature and depth of the case obtained in liquid carburizing two types of sintered steel.

18-207. Improving the Quality of Heat Treated Aluminum Alloy Parts. Davidlee V. Ludwig. *Materials & Methods*, v. 26, Sept. 1947, p. 90-94.

Two factors are commonly overlooked, even in plants which believe they are using the most modern methods, namely, proper method of loading the parts into the furnace (overloading prevents desired convection currents) and slowness in the quenching operation (recommends maximum cycle of 15 sec.).

18-208. The Foundry Data Sheet. (Concluded.) *Foundry*, v. 75, Oct. 1947, p. 203-204.

Glossary of terms employed in heat-treating operations.

18-209. Success in Steel Treating Depends on Experience and Common Sense. W. R. Bennett. *Steel*, v. 121, Oct. 6, 1947, p. 178, 180, 183, 204.

Factors to be considered by the steel treater.

18-210. Factors Involved in Heat Treating a Magnesium Alloy. A. E. Flanigan, I. I. Cornet, R. Hultgren, J. T. Lapsley, and J. E. Dorn. *Metals Technology*, v. 14, Sept. 1947, T.P. 2282, 37 p.

Research on the solution heat treatment and aging of magnesium alloy AZ92 (formerly A.S.T.M. No. 17; also known as Dowmetal C or AM260) which was done under "Restricted" Project NRC-21, in 1942-1943, and reported in detail in a final report to the O.S.R.D. on September 3, 1943, is the basis of this paper. 25 ref.

18-211. The Nature of the Phenomenon of the Hardening of Steel and the High

(Turn to page 42)

Speaks on Materials Engineering

At the Milwaukee Chapter Meeting on Sept. 16 Were, Left to Right: Carl Zilch, Program Chairman; T. C. Du Mond, Managing Editor, Materials & Methods, the Speaker; and Harold Zabel, Chapter Chairman

Steel Scarcity May Continue, Editor Says

Reported by G. B. Kiner

International Harvester Co.

The scarcity of steel is not likely to change for at least a year and might continue for several years, T. C. Du Mond, managing editor, *Materials & Methods*, pointed out before the Milwaukee Chapter at the opening meeting on Sept. 16. His subject was "The Economics of Materials Engineering". The stores of high grade ores are being exhausted rapidly and there are some indications that iron and steel will never return to their prewar prices, he said. In spite of the competition from other materials, iron and steel are still the cheapest materials per pound that are available. This advantage, however, may not last too long.

One of the reasons for the scarcity of steel was brought out by figures secured from the American Iron and Steel Institute. In 1946 there were 33,600 steel consumers as compared to 20,400 in 1939—an increase of 64.7%. The sheet steel situation is particularly bad because of the trend away from castings and forgings to stamped products.

Aluminum and magnesium today offer the greatest potential threat to steel. The speaker pointed out that there are two reasons for this: First, these materials offer strength characteristics which make them suitable for many structural uses. Second, since these materials are among the most abundant on earth, their long-term price trend is downward. Aluminum recently has pushed its way into the electrical wire field where it is highly satisfactory for house wiring. Prior to the war the biggest market for aluminum was in the transportation field. Now its biggest market is in building materials. Much sheet aluminum is now being used for roofing. This use gained impetus during the last few weeks when steel sheet prices advanced and sheet aluminum was reduced in price.

Mr. Du Mond gave a number of specific examples of savings possible through the use of so-called "high strength" steels. He emphasized that standardization of steel analyses is an important factor in economy.

Movies and Entertainment Feature Family Night

Reported by Hans J. Heine

Chief Metallurgist
Pittsburgh Equitable Meter Div.
Rockwell Mfg. Co.

To give the families of members of the Pittsburgh Chapter a better insight into how dad makes a living, the third annual "Family Night" was presented on Oct. 3.

During about an hour and a half's time colored sound movies were shown, interspersed with a bit of musical entertainment.

"Steel for the Ages" by Allegheny Ludlum Steel Corp. gave an interesting step-by-step description of the production of high quality alloy steels used in many walks of our everyday life.

Anaconda Copper Co. supplied a fascinating pictorial account on copper mining in Chile, while several reels entitled "Frozen Freshness" (by General Motors) took the audience to a large country fair where an exhibit pointed out right and wrong ways to prepare and serve frozen foods.

Hardness of Martensite. S. T. Kishkin. *Engineers' Digest (American Edition)*, v. 4, Sept. 1947, p. 443.

Results of some experiments on effect of alloying elements and other factors on hardness and structure. (Translated and abstracted from *Izvestya Akademii Nauk (U.S.S.R.)*, no. 12, 1946, p. 1799-1808.)

18-212. Change of Physical Properties of Cold Drawn Brass During Annealing. G. I. Epifanov. *Engineers' Digest (American Edition)*, v. 4, Sept. 1947, p. 444.

Results of experiments made to check up on a discrepancy in previously published work. It was found that the rate of variation in electrical resistance is particularly large within three temperature ranges: 90 to 120° C., 180 to 240° C., and 300 to 360° C. (Translated and abstracted from *Journal of Technical Physics (U.S.S.R.)*, v. 16, no. 12, 1946, p. 1475-1482.)

18-213. Nuclei of Crystal Growth for Temper Carbon in Black-Heart Malleable Iron. G. Joly. *Engineers' Digest (American Edition)*, v. 4, Sept. 1947, p. 445.

Results of investigation of the number of nuclei and, therefore, the time required for annealing. (Translated and abstracted from *Fonderie*, Nov. 1946, p. 375-382.)

18-214. Advancements in Industrial Heat Treating Equipment. LeRoy A. Lindberg. *Metal Progress*, v. 52, Oct. 1947, p. 586-590.

Developments of past 30 years.

18-215. Examples of Metallurgical Progress at International Harvester Co. *Metal Progress*, v. 52, Oct. 1947, p. 614-624.

Induction hardening of surfaces; continuous heat treatment of ball-bearing race rings; production of gray-iron castings; and production of short-cycle (14½-hr.) malleable iron.

18-216. Liquid Carburizing. *Iron Age*, v. 160, Oct. 9, 1947, p. 48, 50, 52.

George D. Johnston points out some parts of article by H. E. Boyer on practical aspects of surface hardening methods (Aug. 14 issue), which he believes are incorrect. Mr. Boyer's reply.

18-217. New Surface Hardener Combines Precision and Speed. *Iron Age*, v. 160, Oct. 9, 1947, p. 84.

New development, using flames for surface hardening of parts in production quantities, recently announced by the Cincinnati Milling Machine Co.

18-218. Verschijnselen bij de Veroudering van Metallische Systemen. (Phenomena in the Precipitation Hardening of Metallic Systems.) H. C. J. de Decker. *Metalen*, v. 2, Sept. 1947, p. 7-14.

A critical survey of precipitation-hardening phenomena. Changes in mechanical, electrical and magnetic properties, microstructure, and an X-ray study of aging. 15 ref.

18-219. Heat Treatment of Welds. *Coke and Gas*, v. 9, Sept. 1947, p. 271-272, 281.

Recommendations of committee of British Welding Research Assoc.

18-220. High Speed Annealing of Stainless Bars and Tubes. E. S. Kopecki. *Iron Age*, v. 160, Oct. 16, 1947, p. 143-149.

Gas-combustion techniques, based on the ability to generate heat at high rates and permitting precision control over the heat intensity and pattern, which have been developed to the extent of making possible a new economic approach to metal heating and heat treating with gas. Utilization of this technique in the annealing of stainless-steel bars and tubes at Republic Steel Corp. and Allegheny Ludlum Steel Corp., respectively, permits mechanization of the handling of successive charges and results in heating effects being exactly timed and processing being completed at high speeds.

18-221. How to Predict Suitability and Determine Method of Martempering Hypo-Eutectoid Steel. Don Rosenblatt. *Steel*, v. 121, Oct. 20, 1947, p. 94-96, 121, 124, 126.

How technological information may be used in practical shop problems on martempering steel parts.

18-222. Rectification of Neutral Salt Baths. P. H. Kramer. *Iron Age*, v. 160, Oct. 23, 1947, p. 52-54.

A new principle of reconverting the oxides to the original chlorides, instead of forming insoluble reaction products. Advantages accruing from this method, called the neutra-gas process, are said to be cleaner work, lower salt consumption, and elimination of sludge formation.

For additional annotations indexed in other sections, see:
9-132; **11**-150; **16**-123; **27**-222.

274 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

19 WORKING — Rolling, Drawing, Forging

19-312. Reconditioning Hot Mill Rolls. R. S. Trimble. *Iron Age*, v. 160, Sept. 18, 1947, p. 71-73; Sept. 25, 1947, p. 77-80.

Fundamentals of roll grinding; significance of various surface qualities and finishes; types of grinders available; selection of abrasive and bond; effect of changes of wheel speed on surface quality and finish. Grinding wheel feeds and speeds; wheel dressing and balancing; coolants; how to avoid inaccurate grinding and surface defects.

19-313. New Protective Film Cushions Dies and Protects Metal Surfaces in Pressing and Fabricating. *Modern Industrial Press*, v. 9, Sept. 1947, p. 6, 8, 20.

Use of plastic protective film for protection of dies and finished surfaces and the safeguarding of tools and parts in transit, assembly, and storage.

19-314. Shop Shots at Kaiser-Frazer. *American Machinist*, v. 91, Sept. 25, 1947, p. 74-75.

Pressing and trimming of inner windshield frames.

19-315. Developments in Presses Promise Increased Production. *Machine and Tool Blue Book*, v. 43, Sept. 1947, p. 338-342, 344, 346, 348, 350-352.

Marked advances during the past few years in design of mechanical and hydraulic presses.

19-316. Modern Production Forging. F. L. Stamm. *Western Machinery and Steel World*, v. 38, Sept. 1947, p. 108-111.

Procedures and equipment used by General Motors Corp., Los Angeles Forge Division, in its die and forge shop.

19-317. Tools for Upset Forging. R. H. Bell. *Western Machinery and Steel World*, v. 38, Sept. 1947, p. 118-122.

Procedures and equipment used in manufacture of bolts, nuts, rivets, at San Francisco Bethlehem plant.

19-318. A Mechanized Forge. *British Steelmaker*, v. 13, Sept. 1947, p. 461-468.

New British installation.

19-319. Vliv Moreni a Tvareni Plechu na Vymet Pri Lisovani. (Influence of Pickling and Rolling Procedure on the Waste in Rolling.) Bohuslav Otta. *Hutnické Listy*, v. 1, Oct. 1946, p. 73-77.

Results of a study of the effect of inclusions and of pickling and rolling procedure on the formation of cracks and on the amount of waste material produced during cold rolling.

19-320. The Plastic Flow of Aluminum Alloy Sheet Under Combined Loads. W. T. Lankford and M. Gensamer. *Metals Technology*, v. 14, Aug. 1947, T.P. 2237, 31 p.

Several tests developed to permit the study of plastic flow and rupture of sheet metals under a wide variety of combinations of the principal stresses. Stress-strain curves were determined for the aluminum sheet metals 24S-O and 24S-T up to large plastic strains under several methods of loading using both micro- and standard-size specimens. It is concluded that 24S-O and 24S-T conform approximately to an invariant stress-strain relationship in the plastic range. (Presented at Atlantic City Meeting of A.I.M.E., Nov. 1946.)

19-321. Some Problems in Unstable Plastic Flow Under Biaxial Tension. W. T. Lankford and Edward Saibel. *Metals Technology*, v. 14, Aug. 1947, T.P. 2238, 12 p.

Conditions leading to unstable plastic flow for several methods of loading; critical rates of strain hardening at which instability will occur. Completely analytical solutions for the limits of homogeneous strain for these loading methods are obtained for the first time. It is concluded that the limit of homogeneous deformation does not depend merely upon the state of stress, but also upon the method and geometry of loading. 12 ref. (Presented at Atlantic City Meeting of A.I.M.E., Nov. 1946.)

19-322. The Stainless Steels—Forging. Part II. Lester F. Spencer. *Steel Processing*, v. 33, Sept. 1947, p. 558-563, 584.

Methods for determination of corrosion resistance; miscellaneous applications; specifications for forging stock; and recommendations for forging procedures.

19-323. High Temperature Disk Forging Developments for Aircraft Gas Turbines. Part II. L. B. Fonda. *Steel Processing*, v. 33, Sept. 1947, p. 564-567.

Description of bursting investigation. The most important factors were found to be good ductility, good solution treatment, and use of the proper combination of inspection procedures (zyglo and supersonic).

19-324. Wings for Grooving Bars. *Sheet Metal Worker*, v. 38, Sept. 1947, p. 63.

Method and equipment for extending the basic width of grooving bars for finishing flat-seam air-conditioning ducts.

19-325. Quality Wire; Some Factors in Its Achievement. *Wire Industry*, v. 14, Sept. 1947, p. 497-501.

General suggestions for the plant manager.

19-326. A Twelve-End Wire Spooler. *Wire Industry*, v. 14, Sept. 1947, p. 505.

New British machinery.

19-327. Shot-Peening. Fred K. Landecker. *Western Metals*, v. 5, Sept. 1947, p. 15-17.

Increased life of metal parts after shot treatment.

19-328. A Mechanized Forge. *Iron and Steel*, v. 20, Sept. 1947, p. 465-468.

New installation of British firm.

19-329. Precision Drop Forging of High Temperature Alloys. S. G. Demirjian. *Materials & Methods*, v. 26, Sept. 1947, p. 68-71.

How forgings provide superior properties to castings for high temperature alloys. Techniques in forging these alloys, atmosphere control and die steels.

(Turn to page 44)

Traces Steps in Selection of Steels For Welded Designs

Reported by L. Wiley Cooper

Iowa State College

Speaking on "Advances of Welding From the Metallurgical Standpoint", S. L. Hoyt, technical adviser of Battelle Memorial Institute, placed much emphasis on the need for engineers and welding operators to cooperate closely with the metallurgists to prevent errors in the selection of materials for welding construction. Too many times these errors cause a later failure of the structure.

Dr. Hoyt, addressing the Des Moines Chapter on Oct. 14, prefaced his talk with a short history of the development of arc welding, the many steps that led to the coated rod, and the present shielded-arc process.

Based on his personal experience, Dr. Hoyt described the steps followed in the selection and procurement of steels for certain important applications, such as layer pressure vessels, oil well casing, and aircraft engine mounts. In such work the reasons for any failures or shortcomings must be ascertained and then the steel developed to avoid trouble and still meet the requirements of design and production, and be weldable under shop or field conditions.

Dr. Hoyt also analyzed the causes of numerous failures in welded ships in World War II, and attributed them to the use of steel having a low notch toughness for the design and service conditions. Cracks occurred most frequently at moderately low temperatures, and subsequent tests made to determine the notch toughness showed that conventional steels having good notch toughness at elevated or room temperatures would frequently fail at reduced temperatures.

Finally, Dr. Hoyt briefly described his trip to several industrial plants (or the remains thereof) in the Ruhr area, following the war.

New Movie on Galvanizing

"Must It Rust?" is the title of a new 16-mm. sound film made available by the American Hot Dip Galvanizers Association for showing before interested technical groups and meetings. The picture depicts the ravages of rust, the mining of zinc ore and zinc manufacturing processes, the hot dip galvanizing process, photomicrographs of zinc coatings, and finished galvanized parts. The film is in black and white photography with sound accompaniment; running time is 28 min.

Further information about distribution and showing may be obtained from Stuart J. Swensson, secretary of the American Hot Dip Galvanizers Association, Inc., 1611 First National Bank Bldg., Pittsburgh.

19-330. Forging. Frank Charity. *Machine and Tool Blue Book*, v. 43, Oct. 1947, p. 146-148, 150, 152, 154.

Mechanical properties of typical aluminum-alloy forgings. Types of aluminum alloys suitable for forging and machining. Press equipment needed and some heat treating hints.

19-331. The Rubber Die Press as a Tool for Forming Aluminum. E. R. Yarham. *Modern Machine Shop*, v. 20, Oct. 1947, p. 144-146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168.

British practice in the use of rubber press tools, as well as uses, operations which may be performed, equipment. (To be concluded.)

19-332. Effective Use of Rubber Forming Dies. Albert Schuneman. *Steel*, v. 121, Oct. 6, 1947, p. 126, 156, 159.

Sequence of operations in production of 200 flange plate supports from 0.053-in. stainless steel. These dies are suitable where considerable accuracy and low cost are required or where low production does not justify the use of standard-type dies.

19-333. Pressing of L and U Profiles From Sheet. S. Geleji. *Muegyetemi Kozlemenyek*, no. 1, 1947, p. 14-24. (In English.)

A mathematical development of formulas for calculation of the force required.

19-334. The Effect of Mechanical Deformation on Grain Growth in Alpha Brass. J. E. Burke and Y. G. Shiau. *Metals Technology* v. 14, Sept. 1947, T.P. 2265, 14 p.

Results of an extensive study of the above effects includes a complete study of the microscopic behavior of alpha brass under conditions of temperature, time, grain size, and deformation such that recrystallization does not occur or occurs to only a small extent.

19-335. The Comparative Properties of Several Types of Commercial Coppers, as Cold Worked and as Recrystallized. L. R. Jackson, A. M. Hall, and A. D. Schwope. *Metals Technology*, v. 14, Sept. 1947, T.P. 2274, 10 p.

Relations between the degree of cold work and the course of recrystallization. In particular, it is shown that the course of recrystallization over long periods of time and at low temperatures can be predicted with reasonable accuracy from short-time high-temperature recrystallization data.

19-336. Rolling Aluminum; Falkirk Plant of the British Aluminium Co., Ltd. *Metal Industry*, v. 71, Sept. 26, 1947, p. 259-263.

New plant for rolling aluminum sheet. Description of melting shop, slab preparation, rolling plant, annealing furnaces, cutting-off machines, finishing department and inspection and packing.

19-337. Nickel Alloy Extrusion. The Zenith Works of Henry Wiggin and Co., Ltd. A. B. Graham. *Metal Industry*, v. 71, Sept. 26, 1947, p. 265-266.

Plant for hot extrusion and cold working of bars, sections, turbine blading and tubing in nickel alloys.

19-338. Forging Aluminum and Magnesium on a Giant Hydraulic Press. Ralph Moore and J. R. Douslin. *Machinery*, v. 54, Oct. 1947, p. 135-141.

Use of a hydraulic press of 18,000 tons capacity for production of 25,000 lbs. of aluminum or magnesium forgings per 8-hr. shift. Forging of an aluminum gas-turbine impeller and necessary modifications for magnesium forging.

19-339. Hot and Cold Strip Mills; Important Advances Made in the Chicago Area. E. D. Martin. *Metal Progress*, v. 52, Oct. 1947, p. 560-564.

Advances made by Inland Steel Co.'s metallurgists in cold mills and cold rolling include improvement of deep drawing quality of steel and strip and surface quality. Operation of 76-in. rolling mill.

19-340. Die Steels and Their Treatments Pace Drop Forge Industry. Alfred F. Finkl. *Metal Progress*, v. 52, Oct. 1947, p. 581-584.

Developments of past 30 years. Development of better die steels—triple alloy—and better heat treatment based on knowledge of isothermal transformations and other metallurgical theories as well as better tools.

19-341. Tungsten Carbide Rolls for Wire Flattening. Edward C. Slick and Rexford E. White. *Iron Age*, v. 160, Oct. 9, 1947, p. 74-77.

The development of these rolls and the experience of Sylvania Electric Products Co., Inc., in rolling ribbons for the radio-tube industry on machines equipped with carbide rolls.

19-342. How Diamonds Draw Ultra-Fine Wire. Robert L. Zahour. *American Machinist*, v. 91, Oct. 9, 1947, p. 101-108.

Manufacture of the dies as well as drawing of the wire and its inspection.

19-343. Production Processes—Their Influence on Design. Part 28: Rotary Impact Swaging. Roger W. Bolz. *Machine Design*, v. 19, Oct. 1947, p. 101-106.

Power squeezing produces many desirable characteristics. Swaging methods with arrangement of dies, design of machine, support of tubing, and use of hot swaging for harder metals.

19-344. Factors Affecting the Magnitude of Rolling Loads. Eustace C. Larke. *Journal of the Birmingham Metallurgical Society*, v. 27, March 1947, p. 226-251: discussion, p. 252-257.

Various factors involved such as: effect of surface condition of deforming tools; effect of initial thickness; influence of roll diameter; resistance to homogeneous deformation; distribution of pressure on the roll face; and effect of coiler and decoiler tension.

19-345. Use and Care of Diamond Dies. *Industrial Diamond Review*, v. 7, Sept. 1947, p. 274-275.

Abstracted from *Metal Cutting Data*, v. 2, May 1947, p. 5-7.

19-346. Sheet and Tin-Plate Mills. (Concluded.) J. H. Mort. *Iron and Steel*, v. 20, Sept. 1947, p. 431-435; Oct. 1947, p. 481-482, 496.

Calculation of roll-dressing formulas.

19-347. Precision Thread Rolling. W. A. Hawkins. *Machinery (London)*, v. 71, Sept. 4, 1947, p. 261-263.

Principles, procedures, and applications.

19-348. High-Production Die for Forming Fine Wires. L. Segalle. *Machinery (London)*, v. 71, Sept. 25, 1947, p. 347.

Described and diagrammed.

19-349. High Viscosity Compounds Improve Stainless Plate Drawing. *Iron Age*, v. 160, Oct. 16, 1947, p. 130.

Use of hydrogenated castor oil in a severe drawing operation on heavy-gage stainless steel for a railroad car-end stamping.

19-350. Press-Shaping Bath Tubs. *Steel*, v. 121, Oct. 20, 1947, p. 90-91.

Methods and equipment used for the above by Norris Stamping & Mfg. Co., Los Angeles.

19-351. Forming Steel by Cold Extrusion. *Steel*, v. 121, Oct. 20, 1947, p. 93, 128.

Research at Heintz Mfg. Co. on a German process has widened the range of extrudable steels and developed new aids to expedite and control it.

For additional annotations indexed in other sections, see: 9-135; **21**-90-94; **22**-602; **23**-368-369-383-422; **24**-300-302; **26**-152; **27**-236.

322 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

20 MACHINING AND MACHINE TOOLS

20-539. Interesting Applications of Multi-purpose Machines. J. H. Mansfield. *Machine and Tool Blue Book*, v. 43, Sept. 1947, p. 159-160, 162, 164-169.

Way drilling or tapping machines with one fixture and one or more heads presenting tools to different faces of the work. Horizontal and vertical indexing machines with several work stations and one position for loading and unloading the work. Transfer machines, which are frequently referred to as "holeway processing machines" or "automatic production lines".

20-540. How to Cut the Cost of Air-Operated Tools. R. C. Manning. *Iron Age*, v. 160, Sept. 25, 1947, p. 60-62.

A simple but accurate means of checking the actual pressure at the tool; some of the causes of abnormally low pressures at that point.

20-541. New Type Cutter Boosts Gear Output. Walter G. Patton. *Iron Age*, v. 160, Sept. 25, 1947, p. 63.

Gear-cutting machine used by Ford to machine clutch hubs with teeth in six clusters of three each, at the rate of nearly two per min.

20-542. Hopper Feed Speeds Milling Operation. *Iron Age*, v. 160, Sept. 25, 1947, p. 80.

Automatic hopper feed for handling small round pieces in a milling operation developed by Fairchild Camera & Instrument Corp., Jamaica, N. Y.

20-543. Producing Tractor Components. (Continued.) *Machinery (London)*, v. 71, Aug. 28, 1947, p. 227-235.

Manufacture of spur and helical gears and the driveshaft; riveting the crown wheel.

20-544. Group Driving for Power Economy. C. Hayward. *Machinery (London)*, v. 71, Aug. 28, 1947, p. 235.

Advantages and disadvantages of driving machine tools in groups, through lineshaft-and-belt transmission from one large motor.

20-545. A Large Horizontal Boring and Milling Machine. *Engineer*, v. 184, Aug. 29, 1947, p. 203-205.

New machine developed in France and being built in Switzerland.

20-546. Fixtures Make Rotary Surface Grinders Automatic. Fred C. Schaub. *American Machinist*, v. 91, Sept. 25, 1947, p. 69-73.

Typical attachments for grinding to half a thousandth on a continuous production basis.

20-547. How to Grind Carbide Die Parts. Rupert Le Grand. *American Machinist*, v. 91, Sept. 25, 1947, p. 85-96.

Use of preshaped carbide; contour grinding; steps in grinding and lapping round holes in carbide nibs; lapping and polishing operations; wheel selection; machine accessories; inspection equipment.

20-548. Practical Ideas. *American Machinist*, v. 91, Sept. 25, 1947, p. 107-112.

Accurate concave spherical seats made in boring mill, by Francis G. Forquer. Indexing planer tool cuts internal keyways and splines, by D. E. McDonald. Cup wheels can grind in-

(Turn to page 46)

"Harder Than Glass" no Comparison For Toolsteels, d'Arcambal Shows

Reported by William L. Badger
River Works, General Electric Co.

Speaking on "Materials for Precision Cutting Tools and Gages", A. H. d'Arcambal, vice-president of the Pratt & Whitney Division of Niles-Bement-Pond Co., kept his audience keenly interested for nearly two hours as he discussed the characteristics and properties of carbon, alloy and high speed steel, cast nonferrous alloys, cemented carbides, norbide and sapphire. Mr. d'Arcambal addressed the Boston Chapter ⓐ on Oct. 3.

He disillusioned his listeners by stating that "hard as glass doesn't mean a thing since the superficial hardness tester readings are lower than those for hardened carbon or high speed steel". He gave this low hardness, together with brittleness, as a reason for the limited success of glass gages which were used to save strategic alloys during the war.

Advantages are to be gained by multiple tempering of high speed steel and by nitriding treatments on certain applications such as reamers and cut-off tools, he pointed out. Chromium plating has advantages in some special jobs, and subzero treatments are inadvisable except for improperly treated tools and for stability or shrink fits.

Speaker A. H. d'Arcambal (Left), Chairman C. G. Lutts (Center), and Technical Chairman V. O. Homerberg (Right) Examine Various Types of Materials Described by Mr. d'Arcambal Before the Boston Chapter

Mr. d'Arcambal included some information about German tool practice during the war. The shortage of tungsten necessitated the use of steels with progressively lower tungsten content until, at the end of the war, the tungsten was almost entirely removed and the speed of machining substantially reduced.

Coffee talker was Prof. Clark Goodman of M.I.T., who explained the nuclear reactions involved in the preparation of uranium 235 and plutonium.

Summer Jamboree Opens Pitt Chapter Season

Reported by Hans J. Heine
Chief Metallurgist
Pittsburgh Equitable Meter Div.
Rockwell Mfg. Co.

On Sept. 11, 1947, the annual Summer Jamboree of the Pittsburgh Chapter ⓐ was staged at Paradise Gardens. More than 125 members and friends attended the variegated activities, which commenced in the early afternoon and lasted almost around the clock. Buffet lunch and dinner were served, while refreshments consisted of free beer and soft drinks.

Orchids are due George Roberts, Al Berger, Ed Fox, Fred LePointe, Dick Leary, William Neu, Tom McClintock, Monty Mayo, George Enzian, Fred St. Vincent, Ted Haller, Cleve McKenna, Elmore Newton and Bob Nycum for a splendid job as organizers of a memorable jamboree.

ternal and external radii, by James E. McElwee. Non-slip drills, by Lyle C. Vinger. Staker for ball bearings, by Charles Kidwell. Tapped hole gage, by Cecil Curry. Wiggler, by George A. Giller. Jarno-tapered expanding plug eliminates bushing slippage, by Allan B. Nixon. Eccentric boring tool, by Gerhard Wenke. Planer cuts circular arcs, by C. D. Mackinnon. Stepped blocks, by Leonard T. Quick. Extended steady center, by T. Yates. Cam-cutting attachment fits any milling machine, by S. Framurz. Universal punching setup cuts drilling costs, by J. C. Brenner.

20-549. The Sentinel Cri-Dan Threading Machine. *Machinery Lloyd (Overseas Edition)*, v. 19, Aug. 30, 1947, p. 101-102.

British machine tool.

20-550. Spirits and Machine Tools. *Western Machinery and Steel World*, v. 38, Sept. 1947, p. 116-117.

Machine shop of San Francisco works of Schenley Distillers.

20-551. Mass Production Tools. C. D. Rockwell. *Western Machinery and Steel World*, v. 38, Sept. 1947, p. 123-125.

Production of custom-built broaching machines for miscellaneous applications by Pioneer Broach Co.

20-552. Gloster Meteor. Part II. Front Fuselage Construction and Assembly; Outer Wings; Machining of Spar Booms. S. C. Poulsen. *Aircraft Production*, v. 9, Sept. 1947, p. 330-337.

Manufacturing processes used in the production of the Gloster Meteor IV. (Concluded.)

20-553. A New Cleveland Model "AB" 2¼-In. Single Spindle Screw Machine. *Screw Machine Engineering*, v. 8, Sept. 1947, p. 50-51, 54-56.

20-554. New No. 00G & No. 0G Brown & Sharpe Automatics. *Screw Machine Engineering*, v. 8, Sept. 1947, p. 58-63.

20-555. New Britain Automatic Magazine Stock Reel. J. T. Vinbury. *Screw Machine Engineering*, v. 8, Sept. 1947, p. 65-68.

20-556. The New 1¼-In. Model RB Acme-Gridley Bar Automatic. *Screw Machine Engineering*, v. 8, Sept. 1947, p. 70-72.

20-557. New Lead Screw Threading Arrangement for Greenlee Automatics. *Screw Machine Engineering*, v. 8, Sept. 1947, p. 74-75.

20-558. Warner & Swasey 5-Spindle Automatic. *Screw Machine Engineering*, v. 8, Sept. 1947, p. 77-81.

20-559. Stock Ends. *Screw Machine Engineering*, v. 8, Sept. 1947, p. 85.

Countersinking tubing, by R. H. Knowles. Cross slide stock stop, by Maurice C. Ohl.

20-560. Machinability and Structure of Ferrous Materials. C. Sykes. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 235-236; discussion, p. 267-291.

A qualitative discussion. (War Emergency Issue No. 20.)

20-561. The Mechanics of the Cutting Operation. R. N. Arnold and G. A. Hankins. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 238-240; discussion, p. 267-291.

Correlates available information. 10 ref. (War Emergency Issue No. 20.)

20-562. The Effect of Speed, Feed, and Angle on Machinability. W. Whitwprth Taylor. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 258-259; discussion, p. 267-291.

Merchant has developed a relationship between shear angle, angle of friction, and cutting rake, and containing a machinability constant which is a true constant for any given material. Experimental data are presented and compared with calculated values. These verify Merchant's equation and also show that the efficiency with which any given material may be cut is affected by variations in speed, feed, and angle. The direction of these effects is stated qualitatively. (War Emergency Issue No. 20.)

20-563. Tool Materials. J. E. Attwood. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 260-261; discussion, p. 267-291.

Selection for different materials and operations. (War Emergency Issue No. 20.)

20-564. Heavy Engineering. G. M. Baker. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 263-264; discussion, p. 267-291.

Machinability in relation to the economics of the production of large machinery. (War Emergency Issue No. 20.)

20-565. Medium Engineering. L. Johnstone. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 264-265; discussion, p. 267-291.

Machinability in relation to the economics of the production of medium-size items. Comparative cost analyses. (War Emergency Issue No. 20.)

20-566. Light Engineering. P. C. Redwood. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 266; discussion, p. 267-291.

Machinability in relation to the economics of the production of small-size items. (War Emergency Issue No. 20.)

20-567. New Lathe Increases Production on Nonferrous Parts. T. C. Du Mond. *Materials & Methods*, v. 26, Sept. 1947, p. 72-73.

Lathe known as the Electro-Cycle and manufactured by Warner & Swasey makes possible significant increases in production on parts made of brass, aluminum, rubber, and plastics. The greatest factor in providing a rapid work cycle is a method of automatic control which reduces handling time.

20-568. Drill Jig With a Window. Robert Mawson. *Material & Methods*, v. 26, Sept. 1947, p. 110.

Box-type drill jig with several unique features including a window to watch the drilling operation.

20-569. Jig Making Costs Reduced With New Speed Jig. *Machine and Tool Blue Book*, v. 43, Oct. 1947, p. 159-162.

Jig described consists of a number of precision-made parts including frame, bars, corner plates, bushing plates, base plates, and lock clamps which can be easily assembled into an infinite variety of jig and fixture patterns. It makes possible economical production of interchangeable parts requiring drilling and reaming various hole patterns.

20-570. Designing and Using Drill Jigs. C. W. Hinman. *Machine and Tool Blue Book*, v. 43, Oct. 1947, p. 164, 166, 168-172.

Designing procedures in general and specific problems in design of table jigs, jigs for drilling and use of same.

20-571. Finishing With Diamond Tools. Paul Grodzinski. *Machine and Tool Blue Book*, v. 43, Oct. 1947, p. 174, 176, 178, 180.

Finishing parts to one micro-inch with diamond single-point tools.

20-572. Lapped Tools Do a Better Job! *Modern Machine Shop*, v. 20, Oct. 1947, p. 172, 174, 176, 178, 180.

Lapping machines produce tools to exact measurement and edge which can do a more accurate job and hold production for a longer time.

20-573. Ideas From Readers. *Modern Machine Shop*, v. 20, Oct. 1947, p. 202, 204, 206, 208, 210, 212, 214.

Radius fixture on boring mill, by A. R. McAllister. Spring-backed center aids metallizing operation. Eyeglass makes good eraser, by A. H. Waychoff.

20-574. How to Prevent Snagging Wheel Breakage. R. B. Fair. *Foundry*, v. 75, Oct. 1947, p. 82-84, 194, 198, 200.

Proper mounting of wheels and flanges for preventing breakage of abrasive wheels.

20-575. Relation of Machinability to Structure—Nonferrous Metallurgy. A. J. Murphy. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 236-238. (War Emergency Issue No. 20.)

A metallographic study of the mode of deformation in free-cutting nonferrous alloys would be helpful. This study should include an examination of the shearing process occurring at the tool face. 16 ref.

20-576. Nomenclature of the Cutting Edge. Max Kurrein and F. C. Lea. *Institution of Mechanical Engineers Proceedings*, v. 156, Sept. 1947, p. 126-133; discussion, p. 133-134.

Attention is drawn to various terms used to describe the angles of cutting tools and nomenclature adopted in published work and by makers. Rake is used in a number of ways, but always has reference to the face of the tool over which the chip moves but seldom has clearly defined reference to the angle measured on a plane at right-angles to the cutting edge. This angle very largely determines the cutting effects of the tool, and the authors suggest that it should be called the breast angle. Formulas for breast angles.

20-577. Valve Split Cotters. *Automobile Engineer*, v. 37, Sept. 1947, p. 337-338.

Tooling for their production on Wickham five-spindle automatics.

20-578. Machine Tools. *Automobile Engineer*, v. 37, Sept. 1947, p. 351-353.

Recent address by H. E. Linsley to the Wolverhampton section of The Institution of Production Engineers.

20-579. Form Tools. (Continued.) William F. Walker. *Edgar Allen News*, v. 26, Sept. 1947, p. 905-907.

Tangential tools; shaving or skiving tools; and dovetail form tools. (To be continued.)

20-580. Machining Castings for the Ferguson Tractor. *Machinery (London)*, v. 71, Sept. 18, 1947, p. 311-316.

Operations of the Standard Motor Co., Ltd.

20-581. Design of Gearwheels to Work at Reduced Centers. J. Turner. *Machinery (London)*, v. 71, Sept. 18, 1947, p. 316.

Two methods to avoid reduction of distance between centers of a pair of shafts during reconditioning of machine tools.

20-582. Calculation of Offsets for Milling Spiral Cutters. K. G. Molnar. *Machinery (London)*, v. 71, Sept. 18, 1947, p. 317-320.

Extends results previously derived to the special case of spiral milling.

20-583. Machine-Shop Operations in Producing Light Aircraft-Engine Crankshafts. M. F. Colburn. *Machinery*, v. 54, Oct. 1947, p. 146-150.

At Lycoming Division, Avco Mfg. Corp., Williamsport, Pa.

20-584. Fine Finishes and Flatness Obtained by Surface Grinding. *Machinery*, v. 54, Oct. 1947, p. 152-153.

Production of finishes varying from 2 micro-inches for hardened steel to 15 micro-inches for aluminum.

20-585. Recommendations for the Band-Sawing of Steel Molding. H. J. Chamberland. *Machinery*, v. 54, Oct. 1947, p. 190.

Cross sections of eight typical mild-steel moldings varying from $\frac{3}{32}$ to $\frac{1}{8}$ in. Recommendations for the band-sawing of these shapes.

20-586. Air Size Control Gages Workpiece During Operation. J. E. Kline. *Machine Design*, v. 19, Oct. 1947, p. 88-91.

(Turn to page 48)

National Officers Visit Birmingham

Executive Committee Members of the Birmingham Chapter ⚙ Met With the National Officers at the First Meeting of the Season on Sept. 9. In the back row, left to right, are: W. A. Lazier, Sam Carter, G. S. Shoop, Paul Lanier, C. H. Nesbitt, A. S. Stephens, and J. A. Bowers. National Secretary Eiseman is at extreme right. In the front row, seated, are W. H. Riddell; J. P. Flood, secretary-treasurer of the chapter; National President Alfred L. Boegehold; J. Ernest Hill, chapter chairman; and William W. Austin, vice-chairman

Fletcher and Kells Review Toolsteels

Reported by Gene P. Davis
Metallurgist, Warner Gear Div.

"Modern Developments in Heat Treatment and Production of Tool and Die Steels" were reviewed by the dual team of S. G. Fletcher, chief metallurgist, and Ray P. Kells, chief service engineer, of Latrobe Electric Steel Co. before the Muncie Chapter ⚙ at the September meeting.

Dr. Fletcher discussed the composition and heat treatment of high alloy tool and die steels. Relating recent developments in time-temperature-transformation curves to practical operations in heat treating, he pointed out that at the present time heat treatment is based on known fundamental facts of austenite and martensite transformation characteristics.

"Development of these facts led to the use of such modern heat treating procedures as martempering, hot quenching, austempering, isothermal annealing and double and triple tempering of high speed steels," Dr. Fletcher stated. "Heat treating equipment has also been improved, and controlled atmospheres and automatic temperature control are now the rule rather than the exception. The use of salt baths for hardening tools which must have absolutely perfect surface condition has become a commonplace."

Mr. Fletcher pointed out that while great strides were made in heat treating procedure and equipment during the past 15 to 20 years, little had been done to improve basically the quality of the steel itself until the last year or two. The first major improvement was the positive control of segregation. "Since segregation is recognized as a condition which is harmful to tool and die steels in many respects, but one which almost of necessity has to be present to some extent, its control and elimination represent a great stride forward," said Dr. Fletcher.

The nature of segregation and its effects upon the properties and performance of various types of tools and dies were discussed by Mr. Kells. He stressed the importance of its elimination in obtaining more uniform quality, more uniform heat treatment, and more uniform properties.

Details of method for control of micromatic honing operation.

20-587. Continuous Machine Filing Becomes a Production Tool. H. J. Chamberland. *Production Engineering & Management*, v. 20, Oct. 1947, p. 55-58.

Results of recent tests which indicate a steadily increasing use of this process on production work.

20-588. Automatic Spindle Control Cuts Lathe Operation Time. James H. Bennett. *Production Engineering & Management*, v. 20, Oct. 1947, p. 61-64.

Consistent reduction in operating time of turret lathes results from application of electric control to all spindle functions.

20-589. Efficiency Increased by Centralized Tool Control. *Production Engineering & Management*, v. 20, Oct. 1947, p. 66-74.

Conversion to meet peacetime needs. Streamlined production methods at Jack & Heintz, Cleveland.

20-590. Advanced Techniques Characterize Southern Industry. Gerald Eldridge Stedman. *Production Engineering & Management*, v. 20, Oct. 1947, p. 75-78.

Equipment and procedures used by Auto-Soler Co., Atlanta, Ga., manufacturers of machine tools for nailing.

20-591. The Crib. *Production Engineering & Management*, v. 20, Oct. 1947, p. 85.

Handy straight edge, by Edmund L. Johnson. A floating locator, by Roger Isetts.

20-592. Greater Production With Brown & Sharpe Automatics. A. E. Rylander. *Tool Engineer*, v. 19, Oct. 1947, p. 36.

The latest designs and their abilities.

20-593. Cam Units Cut Manufacturing Costs. Karl Stad. *Tool Engineer*, v. 19, Oct. 1947, p. 49.

How completely automatic station-type machines are being tailor-made for the job.

20-594. Fixtures for Casting Qualification. Part I. The Case for Casting Qualification. A. H. Blacker. *Tool & Die Journal*, v. 13, Oct. 1947, p. 60-64, 81-82, 84, 86-87.

Qualifying fixtures are used as an aid in locating rough castings for machining in order to assure that sufficient stock will be found at the locations to be drilled and machined, also to assure proper dimensions upon machining. They are also used to check the foundry equipment by use on the first casting produced. (To be continued.)

20-595. Good Layout Makes Oil Reclamation Pay. *American Machinist*, v. 91, Oct. 9, 1947, p. 88-89.

How batch reclamation of cutting oil can return useful oil to machines on almost continuous basis.

20-596. Why Buick Uses Clamp Toolholders for Carbide Shapes. Rupert LeGrand. *American Machinist*, v. 91, Oct. 9, 1947, p. 90-93.

How Flint plant uses more than 100 of the above setups on multiple-cut gear jobs to save money in seven different ways.

20-597. Fitting Carbides to Small Tools. James Safhill. *American Machinist*, v. 91, Oct. 9, 1947, p. 117.

How carbides were attached to tools for extremely small telephone parts by a British firm.

20-598. Practical Ideas. *American Machinist*, v. 91, Oct. 9, 1947, p. 119-124.

Bench centers measure shafts, by George F. Burnley. Magnifying scriber aids precise layout work, by A. F. Fuller. Lathe makes hour-glass worms, by Ching-Fu Chen. Permanent dogs, by Robert S. Alexander. Grids improve drawing dies, by Aleksander Wolosianski. Die repair, by Fordyce W. Brown. Floating reamer holder stays parallel, by G. A. Coleman. Wheel jig cross drills pins, by H. Moore. Uses of double-coated type adhesive tape, by H. C. Rickenbach. Improved clamp, by Edward O. Merical. Standardized keyways, by William C. Blackham. Diamond dressers clamp to workpiece, by Paul Grodzinski. Pipe fittings make drill conversion, by N. S. Beebe. Steadyrest, by T. Yates. Broaching slots, by Donald A. Baker. Welded pipe die saves hundreds of dollars, by Raymond F. Ball. Chuck guide, by Edmund L. Johnson. Tailstock coupling, by Lyle Vinger. Milling machines swing large diameters, by R. M. Dunlevy. Simple drill vise, by Arnold Dyck. Table stop frees miller operator, by John Meyer. Hexagonal broach, by Dana J. Mulholland. Shaper tests new dies, by Arnold Dyck.

20-599. Checking Squares and Angle Plates. E. J. Rychlik. *American Machinist*, v. 91, Oct. 9, 1947, p. 155.

How the error in both a square and an angle plate can be obtained from two readings taken with a dial indicator and height gage.

20-600. Safe Use of Portable Grinders. *American Machinist*, v. 91, Oct. 9, 1947, p. 157, 159.

Recommended procedures.

20-601. An Electromechanical Disk Saw for Metal. A. F. Ushakov. *Industrial Power (U.S.S.R.)*, Aug. 1947, p. 9-10. (In Russian.)

Proposed method for cutting metal up to 150 mm. thickness by means of an electric arc thrown from a rotating "saw". The reinforced disk of soft steel has teeth which maintain an arc in constant contact with the work to be cut and at the same time remove the newly cut metal.

20-602. Swiss Grinding Machines. *Industrial Diamond Review*, v. 7, Sept. 1947, p. 267.

Two machines made by Miedsa (Machines Industrielles et Domestiques S.A., Carouge-Geneva).

20-603. Grinding Form Cutters With Radius Corners. *Industrial Diamond Review*, v. 7, Sept. 1947, p. 273.

Attachment is designed primarily for the Jones & Shipman tool and cutter grinder, but also useful on similar types of machines.

20-604. Precision Honing Machine. *Industrial Diamond Review*, v. 7, Sept. 1947, p. 279.

British machine which finishes internal cylindrical surfaces and corrects errors of ovality and taper. Mirror finished holes can be produced to very close tolerances as to size and straightness.

20-605. Machining Tractor Rear Axle Components. *Machinery (London)*, v. 71, Sept. 4, 1947, p. 255-260.

From stamping to finished axle. Setup of machines used for milling, hobbing, drilling, and grinding.

20-606. A Useful Property of the 60° V-Block. J. Turner. *Machinery (London)*, v. 71, Sept. 4, 1947, p. 260.

It is shown that the distance from the apex of the V to the center of a circular piece resting on the V is equal to the diameter of the circle. How this fact is applied to the centering of workpieces of varying diameters.

20-607. The Production of British Clearing Heavy Presses. *Machinery (London)*, v. 71, Sept. 4, 1947, p. 264-266.

Some machinery operations used by Vickers-Armstrongs, Ltd.

20-608. Indexing Milling Fixture for Aluminum Alloy Cylinder. *Machinery (London)*, v. 71, Sept. 4, 1947, p. 267-268.

Machining operations that are necessary. Design of fixture and how it is mounted.

20-609. Machining Die Cast Number Wheels. P. H. Gates. *Machinery (London)*, v. 71, Sept. 25, 1947, p. 354-355.

Method used for combination-lock assembly.

20-610. Solid Carbide Boring Bars. *Iron Age*, v. 160, Oct. 23, 1947, p. 44-45.

Precision boring with solid-carbide boring bars with length-to-hole-diameter ratios of as much as 8 to 1 is being done in steel, cast iron, meehanite, brass, and other metals. Three specific applications described.

For additional annotations indexed in other sections, see: 9-126-127-128-129-130; **19**-312; **23**-394; **24**-299-334; **27**-221.

539 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

21 LUBRICATION and Friction; Bearings

21-86. How to Select the Best Oils for Hydraulic Equipment. D. C. Miner. *Machine and Tool Blue Book*, v. 43, Sept. 1947, p. 328-332, 334, 336-337.

There are two bases from which to evaluate oils for use on hydraulic equipment. Both methods are discussed from the standpoint of decreasing maintenance costs and increasing service life of equipment.

21-87. Babbitt Alloys for Plain Bearings. P. G. Forrester. *Engineering*, v. 164, Aug. 29, 1947, p. 208-209.

The fundamental requirements of a bearing alloy show that babbitt and similar alloys have considerable advantages from a frictional point of view. (To be continued.)

21-88. 18,000 Ways to Fight Friction. H. O. Smith. *Scientific American*, v. 177, Oct. 1947, p. 149-153.

Various types of bearings.

21-89. Cutting Fluids, Chipbreakers, etc. W. A. Carter. *Institution of Mechanical Engineers Proceedings*, v. 155, 1946, p. 261-263; discussion, p. 267-291.

A general discussion. (War Emergency Issue No. 20.)

21-90. Torrington Four-Row Roll Neck Bearings. *Bearing Engineer*, v. 7, July-Aug. 1947, p. 5.

Recommended factors for installation and operation of rolling-mill bearings.

21-91. Seizing of Certain Metals at 750° F. *Materials & Methods*, v. 26, Sept. 1947, p. 113.

Test results for combinations of 21 different bearing metals and alloys.

21-92. Evaluation of Water Resistance Properties of Lubricating Greases. T. G. Roehner and E. S. Carmichael. *Institute Spokesman*, v. 11, Sept. 1947, p. 4-7, 12-13, 16-17. *Oil and Gas Journal*, v. 46, Oct. 25, 1947, p. 107, 109, 111.

Various test procedures for the water resistance properties and also for rust-preventive properties. Comparative test data indicate the value of the various methods.

21-93. Plain Bearings. *Automobile Engineer*, v. 37, Sept. 1947, p. 325-335.

Products and manufacturing methods of British firm.

21-94. Lubrication in Forging Operations. *Lubrication*, v. 33, Sept. 1947, p. 97-108.

Lubrication systems for typical machinery used in the above.

21-95. An Electrical Study of Boundary Lubrication. V. H. Brix. *Aircraft Engineering*, v. 19, Sept. 1947, p. 294-297.

Use of electrical resistance measure-

(Turn to page 50)

Traces 30 Years' Development in Canadian Foundries

Reported by W. R. Holden

Plant Metallurgist, Canadair Limited

W. J. Langston, president of Canada Iron Foundries, who discussed Canada's growth in the gray iron foundry business before the first meeting of the year of the Montreal Chapter ⚙, followed family tradition by entering iron foundries and machine shops in Sydney, Australia, before coming to this country at an early age. He has been with his present company for the past 30 years.

Accurate analytical control of pigs in the foundry is commonplace today, but in the early days the general rule was to break a few pigs and classify them by fracture appearance as Type 1 or Type 2. This, of course, gave little control over the customer's product, and alloys were the exception.

Mr. Langston named three factors that have led to increased efficiency:

1. The development of oval cupolas for service in the range of large diameters, twin cupolas for 25 tons capacity and above, and lower tuyeres. With coke now selling at 1¢ per lb., these are proving their economies.

2. The adoption of molding machines, extensive handling equipment and core blowing.

3. Centrifugal casting for tubes and the centrifuge casting of irregular shapes.

In the beginning the customer often called for alloy castings and got them at greater cost; but with control lacking, the advantage gained was often doubtful. Development and research have now given the customer his dollar value in alloy castings.

Long-term studies have brought about the regulation of silicon and carbon for thickness and strength. Results of extensive research on the part of prime metal producers are available to foundries, and this has been a major factor in the widespread production of nickel and nickel-chromium cast irons.

A great deal of emphasis has been placed on sulphur control—a precaution that is not always necessary. During the crisis of World War I, the limit for car wheels was raised from 0.14 to 0.22% without ill effect. Phosphorus, however, is much more critical, as was proven in a long-term study of automotive parts.

Organizes Refractory Business

Louis Lyon, Jr., well known in the refractory business, has formed his own organization, Lyon & Co., with offices in the Park Bldg., Pittsburgh. He will represent several prominent manufacturers of refractory products. Mr. Lyon, a chemical engineer, was formerly Pittsburgh district sales manager of National Refractories Co. of Philadelphia. He graduated from Georgia Tech in 1926 and has resided in Pittsburgh since that time.

Payson Speaks at Lehigh

Reported by Richard T. Saeger

Bethlehem Steel Co.

A group of about 100 members heard Peter Payson of Crucible Steel Co. of America give his justly famed talk on "The T-T-T Curve as a Guide to the Heat Treatment of Steel" before the Lehigh Valley Chapter ⚙ on Oct. 3. An interesting question and answer period followed the talk.

Coffee speaker at the dinner prior to the technical session was R. L. Deilly, chairman of the Lehigh Valley Chapter. He presented some pertinent information regarding the chapter's affairs and activities.

Foundry Supplier Builds New Plant

Shanafelt Mfg. Co., Canton, Ohio, a 54-year-old manufacturer of foundry products, has recently completed the moving of its entire operations to a new, modern, single-story building with 35,000 sq.ft. of floor space. Chief products of the company are the patented Shanafelt steel foundry flasks and Seal-Tyte chaplets.

ments in this study. It was possible to obtain smooth curves for the voltage-current relationships at various loads and speeds. Conclusions are drawn from the results concerning the mechanism of boundary lubrication and the effects of "mild E. P." additives and of bearing metals.

21-96. Babbitt Alloys for Plain Bearings. P. G. Forrester. *Engineering*, v. 164, Sept. 5, 1947, p. 234-235.

The different manufacturing procedures.

For additional annotations indexed in other sections, see: 19-349.

112 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

22 WELDING
Flame Cutting; Riveting

22-536. The Welding of Lead. *Machinery Lloyd (Overseas Edition)*, v. 19, Aug. 30, 1947, p. 84-86.

Techniques and applications.

22-537. Selecting Current for Inert-Arc Welding With Tungsten Rods. *Iron Age*, v. 160, Sept. 25, 1947, p. 76.

Chart shows current levels for each electrode size.

22-538. Controlling Weld Metal When Making Repairs. *Power Plant Engineering*, v. 51, Aug. 1947, p. 92-93.

Use of carbon in the form of paste, plates, and rods as an aid in the control of the welding puddle.

22-539. I Principi della Saldatura Ossiacetilenica delle Leghe Leggere. (The Principles of Oxy-Acetylene Welding of Light Alloys.) *Alluminio*, v. 16, May-June 1947, p. NdO 65-NdO 89.

A general discussion of autogenous welding, with special reference to aluminum and its alloys. 11 ref.

22-540. Safety-Weld Coupling on Pipe-Line Maintenance Work. J. B. Smith. *Oil and Gas Journal*, v. 46, Sept. 20, 1947, p. 193-194, 240.

New procedure and device for welding joints in pipe lines in service and under pressure.

22-541. Welding Metallurgy. J. G. Ball. *Metal Industry*, v. 71, Sept. 5, 1947, p. 199-202.

Recent progress in the nonferrous alloy field. 10 ref. (To be concluded.)

22-542. Welding and Marine Engineering; an Examination of Present Tendencies. A. C. Hardy. *Welding*, v. 15, Sept. 1947, p. 399-407.

The application of welding in relation to recent developments in marine engine construction. The present and future possibilities of fabricated units from the point of view of economic engine design.

22-543. British Shipbuilding. Part 2; The Harland and Wolff Yards, Belfast. E. Cuthbert and Denis Rebbeck. *Welding*, v. 15, Sept. 1947, p. 429-440.

Arrangement, procedures, and equipment used in fabrication of welded ships.

22-544. How Scientific Welding Can Assist the Paper Mill Engineer. C. W. Brett. *Paper Making and Paper Selling*, Summer 1947, p. 38-39.

Uses of welding repair.

22-545. How to Weld Lead Pipe. L. S. Bowser. *Heating, Piping & Air Conditioning*, v. 19, Sept. 1947, p. 91-92.

Practical information on welding lead pipe for industrial systems.

22-546. Methods of Joining Pipe: Screwed Joints for Ferrous and Brass Pipe. J. E. York. *Heating and Ventilating*, v. 44, Sept. 1947, p. 76-82.

First of a series containing engineering data on the various methods employed for joining ferrous and nonferrous pipe.

22-547. Welding by the Inert-Arc Process. R. W. Tuthill and W. J. Campbell. *Heating and Ventilating*, v. 44, Sept. 1947, p. 83-86.

Application to the rapid welding of stainless alloys, copper alloys, and aluminum.

22-548. Spattering of Fused Metal During Welding With Coated Electrodes. A. A. Erokhin. *Avtogennoe Delo (Welding)*, no. 5, 1947, p. 1-7. (In Russian.)

Investigated theoretically and experimentally, it was found that this phenomenon is induced by the presence of hydrogen in the weld metal. Conditions for the occurrence of spattering and its mechanism. 20 ref.

22-549. Current Irregularities in Contact-Welding Machines. A. E. Blitshtein. *Avtogennoe Delo (Welding)*, no. 5, 1947, p. 7-10. (In Russian.)

Theoretical and experimental investigation indicates that the character of the primary and the secondary current at the moment of contact may be quite different in spot, seam, or butt welding. Current variations.

22-550. Hard Welding of High-Chromium Steels. T. N. Dubova and F. I. Rasdui. *Avtogennoe Delo (Welding)*, no. 5, 1947, p. 11-14. (In Russian.)

Investigation included welding conditions, electrode compositions, chemical analysis of weld metal and mechanical strength and hardness of the welds. It was found that 1 to 2% graphite in the coating results in a weld material of high mechanical strength and hardness.

22-551. Automatic Welding of a Gas Tank of Large Dimensions. E. K. Alekseev. *Avtogennoe Delo (Welding)*, no. 5, 1947, p. 20-22. (In Russian.)

Method used.

22-552. Welding of Spherical Regeneration Tanks 12.98 M. in Diameter. E. D. Lonskii. *Avtogennoe Delo (Welding)*, no. 5, 1947, p. 23-26. (In Russian.)

Second part of article begun in the no. 2 issue for 1947.

22-553 Spot and Resistance Welding of 18-8 Stainless Steel. D. S. Balkovets. *Avtogennoe Delo (Welding)*, no 5, 1947, p. 27-29. (In Russian.)

Data in tabular form for 18-8 of different sizes and shapes.

22-554. A New Type of Torch for Gasoline Welding. S. V. Begun. *Avtogennoe Delo (Welding)*, no. 5, 1947, p. 29. (In Russian.)

With controllable preheating of liquid fuel, experimental results showed applicability of such torches in welding of different light metals and alloys.

22-555. Gas Welding Equipment Required in Steel Construction. G. S. Dubinskii. *Avtogennoe Delo (Welding)*, no. 5, 1947, p. 30-31. (In Russian.)

Equipment recommended by the author.

22-556. The Control of Automatic Welding Under Flux. I. L. Brinberg. *Avtogennoe Delo (Welding)*, June 1947, p. 1-8. (In Russian.)

Factors influencing the process. Methods of control for each individual type of weld.

22-557. Automatic Welding of Small Bolts or Pins. N. G. Ostapenki, Iu. A. Sterenbogen and D. A. Dudko. *Avtogennoe Delo (Welding)*, June 1947, p. 12-15. (In Russian.)

A newly developed, manually operated welding gun weighing about 5 lb. will handle bolts and pins up to 12 mm. in diameter and 80 mm. in length.

22-558. Distribution of Stress in Welded Joints. M. F. Sichikov and Z. D. Vishnevetskii. *Avtogennoe Delo (Welding)*, June 1947, p. 15-18. (In Russian.)

Use of plastic models for determination of stress distribution, and the photoelastic method to reveal the stress patterns.

22-559. Automatic Welding of Cromansil Steel Under Flux. Ia. A. Zav'ialov. *Avtogennoe Delo (Welding)*, June 1947, p. 19-21. (In Russian.)

The welding of Cromansil steel (0.99% Mn, 0.93% Si, 0.74% Cr, 0.35% C, 0.23% Mo, 0.020% P, and 0.012% S), which is widely used in structural work, using different welding rods. Satisfactory results were obtained with rods of 20MA steel (composition given) and AH-1 or O.C.Ts.-45 fluxes (composition not given.)

22-560. Copper-Cadmium Alloy for Electrodes Used in Spot Welding Machines. V. A. Ivanov, A. V. Shadrin, and P. I. Shopin. *Avtogennoe Delo (Welding)*, June 1947, p. 21-25. (In Russian.)

A series of Cu-Cd alloys was investigated in a search for more durable welding electrodes. The alpha solid solution (1 to 1.5% Cd) was found most satisfactory. Method of production and test results.

22-561. Shearing of Rivets by Means of an Oxy-Acetylene Torch. S. G. Gusov. *Avtogennoe Delo (Welding)*, June 1947, p. 25-26. (In Russian.)

Design and technique of use for torch developed for cutting off rivets.

22-562. Developments in the Welding of Armor. T. L. H. Butterfield. *Welder*, v. 16, April-June 1947, p. 26-32.

Early attempts to weld light armor with ferritic electrodes; advantages of austenitic electrodes; hydrogen theory for the mechanism of cold cracking; welding of light armor steels with austenitic electrodes; effects of carbon content, hardenability, and heat treatment on weldability; welding of heavy armor; use of large-gage electrodes; hot cracking of austenitic weld metal; and future possibilities for development.

22-563. The Fabrication of Framed Structures in High Tensile Structural Steel by Welding. (Continued.) R. Digby Smith. *Welder*, v. 16, April-June 1947, p. 33-35.

Selective-testing and dimensional-checking procedures used at central testing stations in Britain during the war.

22-564. Stud Welding. H. Martin. *Welder*, v. 16, April-June 1947, p. 36-39.

Welding of bolts of ferrous and nonferrous materials to sheet metal by the Cyc-Arc process.

22-565. Spotlight on Arc Welding. Part II. *Welder*, v. 16, April-June 1947, p. 40-42.

Miscellaneous applications.

22-566. Electric Arc Welding in H. M. Dockyard. Part III. *Welder*, v. 16, April-June 1947, p. 43-46.

Welding shop at Devonport. Personnel problems. Welding on carrier *Terrible*.

22-567. Electric Furnace Brazing Solves a Problem. Stephen Porter Lathrop. *Materials & Methods*, v. 26, Sept. 1947, p. 110.

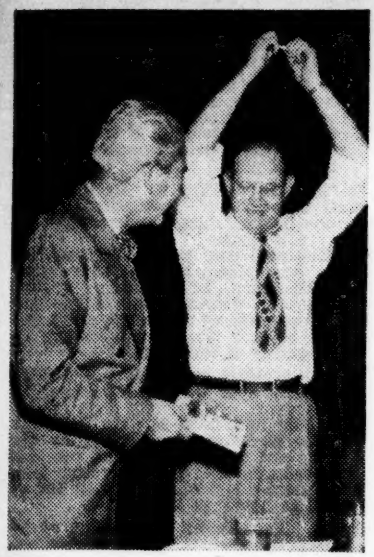
Welding four small stainless-steel tubes into a stainless piece which in turn is inserted in a brass outer shell. Using the torch method, one weld would melt while another was being made.

22-568. Shop Using Heliarc Welding With Four Other Processes. *Sheet Metal Worker*, v. 38, Sept. 1947, p. 55-57.

Use of d.c.-arc, a.c.-arc, oxy-acetylene, and planograph-torch welding, as well as Heliarc welding, which is preferred in most cases, in welding miscellaneous sheet-metal products.

(Turn to page 52)

Magician at Peoria Stag



Vincent Gottschalk, Nationally Known Magician, Works on O. Wieseman of Caterpillar Tractor Co. at the Annual Stag That Started the Fall Season for the Peoria Chapter on Sept. 8. The A.S.M. film, "Metal Crystals", was shown as the first in a series of educational films to be presented during the current fall season

Traces Development Of Heat Resisting Steels Having Longer Life

Reported by John F. Collins

University of Notre Dame

With the development of the gas turbine, designers are asking for steels having longer life at high operating temperatures and it is the duty of the metallurgist to satisfy these requirements, pointed out Alexander L. Feild in addressing the Notre Dame Chapter on Oct. 8. Before its recent merger with the American Rolling Mill Co., Mr. Feild was director of research of the Rustless Iron and Steel Corp., and continues as associate director in charge of all stainless steel and high-temperature alloy research.

The stress-rupture test, said Mr. Feild, is the most important single test for determining the serviceability of heat resistant steels at high temperatures. The creep test is important for materials that are to last indefinitely in service. Slides of the mechanical testing equipment used in his laboratory were shown by the speaker.

Curves were shown to illustrate high-temperature properties of a number of heat resistant alloys under varying conditions of load and temperature. Mr. Feild divided heat resistant steels into five groups, according to composition: *(a)* standard Fe-Cr stainless steels, *(b)* standard Fe-Cr-Ni stainless steels, *(c)* modifications of Fe-Cr-Ni grades, *(d)* cobalt-containing alloys, and *(e)* nickel-base alloys.

Refrigerators and Parts Inspected, Described

Reported by L. G. Toye

Metallurgist, General Electric Co.

Developments in the manufacture of refrigerators over the past 20 years were reviewed before the opening session of the Northwestern Pennsylvania Chapter on Sept. 25. L. W. Atchison, assistant works engineer of the refrigerator division of General Electric Co., was the speaker, and the meeting was held at the General Electric Community Center in Erie, Pa.

Manufacture of the stainless steel evaporator by seam welding, the use of freon refrigerants, and use of aluminum brazing in the construction of home freezers were among the important technical developments. The past 20 years have witnessed a decided decrease in unit weight and current consumption, and the general adoption of the hermetically sealed unit by the industry.

Complete refrigerators and home freezers were on display, as well as component parts of the unit assembly. These parts were passed around for examination by the visitors, and Mr. Atchison answered numerous questions concerning the material and manufacture.

The meeting was adjourned at 9:30 p.m. and the entire group taken on a conducted tour of the General Electric refrigerator assembly lines beginning with the inspection of unit parts, and ending with the completed refrigerator ready for shipment.

Terre Haute Hears Focke

Reported by Kenneth O. Uran

Production Control Manager Columbian Enameling & Stamping Co.

The Terre Haute Chapter, in celebration of National Officers Night, spent a pleasant evening with National Trustee Arthur Focke, whose talk "The Metallurgist, the A.S.M. and the Metal Industry" prompted a lively and interesting discussion in which nearly all of the members present took part.

Chairman Hazledine announced an innovation in the meeting procedure in that a new program chairman would be appointed each month. Stephen Reynolds was chosen for program chairman for the Nov. 10th meeting.

22-569. Lead Welding Practices. *Sheet Metal Worker*, v. 38, Sept. 1947, p. 58-61, 106. (Reprinted from *Linde Tips.*)

22-570. High Frequency Vibrations in the Soldering of Aluminum. *Machinery Lloyd (Overseas Edition)*, v. 19, Sept. 13, 1947, p. 83.

Results of investigation by National Research Council, Ottawa, Canada. High-frequency sound was successfully used to remove oxide films from the product to be coated. It was found that strips of aluminum could readily be coated by dipping them into a melt vibrating at 4000 cycles per sec. Use of a vibrating soldering iron.

22-571. The Deposition of Hard Facing Alloys. *Machinery Lloyd (Overseas Edition)*, v. 19, Sept. 13, 1947, p. 84-85.

Importance of the correct electrode and the part played by the parent metal.

22-572. Welding Hardenable Steels. Orville T. Barnett. *Steel*, v. 121, Sept. 22, 1947, p. 72-74, 110; Sept. 29, 1947, p. 80-84, 114, 117.

The Lehigh system for analyzing weldability of hardenable steels. Use of S-curves for learning the mechanics of steel transformations; relation of martensite formation to preheat, interpass temperature and postheat treatments; and use of lime-ferritic low-hydrogen electrodes.

22-573. How to Increase Flexibility of Automatic Arc Welding. *Steel*, v. 121, Sept. 29, 1947, p. 112.

How a skilled welder can switch without difficulty from job to job having different fitups and different joint preparation, using the new welding positioner.

22-574. Laying the Biggest Inch Pipe Line. *Welding Engineer*, v. 32, Oct. 1947, p. 42-43.

Equipment and procedures, especially for welding the sections together.

22-575. Spot Welded Display Signs. *Welding Engineer*, v. 32, Oct. 1947, p. 59.

Change-over to resistance welding has cut considerable time and labor from the production of large sheet-metal signs for display advertising.

22-576. Flux-Injection Cutting. Part II. G. E. Bellew. *Welding Engineer*, v. 32, Oct. 1947, p. 60-62.

New process makes it possible to flame-cut stainless steels on a production basis by injecting powdered flux via the cutting-oxygen stream. Applications.

22-577. Causes and Cures for Hot Welding Cables. R. L. Townsend. *Welding Engineer*, v. 32, Oct. 1947, p. 70-71.

How and what to check to discover causes, and what to do to correct the trouble.

22-578. Welding in the Iron Foundry. H. E. Schultz. *Foundry*, v. 75, Oct. 1947, p. 78-80, 136, 139.

Welding procedures applicable to iron foundry work and some of the factors necessary to insure a successful repair-welding program.

22-579. Ship Welding Research. *Engineer*, v. 184, Sept. 19, 1947, p. 277-278.

Recent British work and future plans.

22-580. Award to General Electric Co. for an Alternating Current Inert-Atmosphere Arc Welder for Aluminum. *Electrical Manufacturing*, v. 40, Oct. 1947, p. 134-139, 250, 252.

Illustrated and described.

22-581. Cutting Corrosion-Resistant Alloys by the Flux-Injection Method. *Machinery*, v. 54, Oct. 1947, p. 165-166.

Fabrication of stainless steels by a combination of flame-cutting and welding by above method in which a special dry nonmetallic flux is carried directly by the oxygen stream to cope with the refractory oxides formed by the alloy elements.

22-582. Powder Process Simplifies Stainless Steel Cutting. *Production Engineering & Management*, v. 20, Oct. 1947, p. 59-60.

Linde processes for oxy-acetylene cutting of stainless or chromium steels.

22-583. Temperature Chart for Soldering, Brazing and Welding Processes. Richard C. Hitchcock. *Product Engineering*, v. 18, Oct. 1947, p. 171.

22-584. Pressure Welding. A. L. Burns, Jr. *World Oil*, v. 127, Oct. 1947, p. 92, 94, 96, 98.

Machine produces pressure welds in line pipe. How high-grade welds are assured.

22-585. Water Tank Seams Welded in Continuous Mill. *Iron Age*, v. 160, Oct. 9, 1947, p. 67.

Tells how production of 14-gage water-softener tanks has been stepped up to 180 units per hr. by use of a welding mill using the Linde Union-melt process.

22-586. Nonmagnetic Arc Welding Joints Between Mild Steel Plates. O. C. Frederick. *Steel*, v. 121, Oct. 13, 1947, p. 85, 124.

Use of nonmagnetic materials is often required in the manufacture of switch gear and other electric equipment to break up magnetic circuits. Use of an arc-welded seam of nonmagnetic composition makes possible the elimination of special steels or nonferrous metals and simplifies welding of component parts. Gives results of an investigation to determine minimum root spacing in groove design required for producing a nonmagnetic arc-welded band between mild-steel plates, when using stainless-steel and aluminum-bronze electrode filler metals. Results indicate that thickness of plate material has little bearing on groove width. Type of electrode, diameter of electrode, welding current, and welding technique are the prime factors.

22-587. Reactions of Silicon and Manganese During Automatic Welding of Low-Carbon Steel Using Fluxes. K. V. Liubavskii. *Avtogennoe Delo (Welding)*, July 1947, p. 1-10. (In Russian.)

Results of an extensive theoretical and experimental investigation of the reactions. It is shown that the reactions may proceed either very slowly or vigorously depending on whether the concentrations of Si and Mn are close to or far from equilibrium. The welding process was investigated under both passive and active conditions. The formation of silicate inclusions and the mechanical properties of the weld metal were also investigated. 16 ref.

22-588. Welding Electrodes "E-55-Zh". M. G. Popov. *Avtogennoe Delo (Welding)*, July 1947, p. 10-13. (In Russian.)

Results of an investigation of the effect of welding variables on the properties of the weld metal produced by use of the above electrodes (composition given) for the welding of steel containing 24% Cr and 12% Ni.

22-589. Concerning an Investigation of the Strength of Spot Welded Joints. G. P. Mikhailov and A. A. Laptev. *Avtogennoe Delo (Welding)*, July 1947, p. 13-14. (In Russian.)

Results of theoretical calculation and experimental investigation of the stress distribution among spot welds with different distances between the spots and in different thicknesses of plate.

22-590. Gasoline-Oxygen Cutting of Steel Under Water. V. M. Agapov. *Avtogennoe Delo (Welding)*, July 1947, p. 16-19. (In Russian.)

Two types of torches for use with the above—one with electrical vaporization, the other with mechanical spraying of the gasoline. Results of a laboratory investigation of the process.

22-591. Submerged Welding With an Enclosed Arc. K. V. Vasil'ev and M. S. Kaufman. *Avtogennoe Delo (Welding)*, July 1947, p. 19-21. (In Russian.)

Technique using pieces of wood with grooves in them to cover up the electrode, thus providing a channel for the escaping gases which thus keep the water from extinguishing the arc. Electrode composition; welding current; rate of welding; chemical analysis of base metal, electrode metal, and weld metal; and weld strength.

22-592. Arc Welding of "Mark EI-257" Steel Pipe. A. N. Pogromskii. *Avtogennoe Delo (Welding)*, July 1947, p. 21-24. (In Russian.)

The steel used and its composition; the experimental methods used; establishment of optimum welding conditions; determination of mechanical properties of the welds; and influence of heat treatment schedules on the quality of the welds.

22-593. Welding and Joining of Cutting Tools With Spot Welding Machines. K. P. Imshennik. *Avtogennoe Delo (Welding)*, July 1947, p. 24-26. (In Russian.)

The electrode and fittings for the above and other information concerning recommended procedures for joining hard-alloy tools to other metals used as holder or support.

22-594. Experiment on Welding of T-Shaped Beams. V. A. Verkholantsev. *Avtogennoe Delo (Welding)*, July 1947, p. 26. (In Russian.)

Difficulty was experienced with working during the welding of the two T-shaped beams. How the trouble was remedied by proper weld design.

22-595. Cold Welding of Cast Iron. N. A. Rybchinskii. *Avtogennoe Delo (Welding)*, July 1947, p. 28. (In Russian.)

Improved repair-welding technique and composition of the electrode coating for steel.

22-596. Production of High Quality Flash Butt Welds. J. S. Blair. *Transactions of the Institute of Welding*, v. 10, Aug. 1947, p. 107-117.

To obtain the best work in this form of welding, it is necessary to establish, by experimental work, the requisite technique and then to make every weld under precisely the same conditions, aided where necessary by special check apparatus operating at each weld. An occasional routine test to destruction is also recommended.

22-597. Ship Welding as Practiced on the Tyne. Norman M. Hunter and J. P. Wadling. *Transactions of the Institute of Welding*, v. 10, Aug. 1947, p. 118-120.

Application of the process to large tanker construction. Large folding drawings.

22-598. Welding in Marine Engineering. J. A. Dorrat. *Transactions of the Institute of Welding*, v. 10, Aug. 1947, p. 121-125.

Modern methods and trends.

22-599. Arc Welded Structural Steelwork. Built-Up Girders and Compression Members. *Transactions of the Institute of Welding (B.W.R.A. Supplement)*, v. 10, Aug. 1947, p. 2-5, 20.

Recommendations of the FE.13 Committee for the design and fabrication of welded members.

22-600. Electrode Selection for Hard Facing. *Metallurgia*, v. 36, Sept. 1947, p. 278-279.

Condensed from "Hard Facing With Murex", Welding Processes, Ltd., Waltham Cross, Herts., England.

22-601. Welding Metallurgy. J. G. Ball. *Metal Industry*, v. 71, Sept. 12, 1947, p. 219-222, 227; Oct. 10, 1947, p. 299-301.

Recent progress in the nonferrous alloy field. Numerous tables, charts, and photomicrographs from the publications reviewed. (To be continued.)

22-602. Electric Welding and Upsetting Operations on Tractor Parts. *Machinery*

(Turn to page 54)

Addresses of Manufacturers

(Continued from page 17)

Denison Engineering Co. (R-967, 980, 983, 987)
1160 Dublin Rd.
Columbus 16, Ohio

Di Machine Corp . (R-976)
2711 West Irving Park Rd.
Chicago 18, Ill.

Diamond Machine Tool Co. (R-973)
Los Angeles, Calif.

Die Tool Engineering Co. (R-968)
18800 Hawthorne Ave.
Detroit 3, Mich.

DoAll Co. (R-970, 971)
Des Plaines, Ill.

Fast Feed Machine Corp. (R-974)
228 Kunkle Bldg.
Ashtabula, Ohio

Glengarry Machine Works, Inc.
Bay Shore, N. Y. (R-943)

Glyco Products Co., Inc. (R-949)
26 Court St.
Brooklyn 2, N. Y.

Hangsterfer's Laboratories, Inc.
15 Cooper St. (R-948)
Woodbury, N. J.

Hufford Machine Works (R-964)
Redondo Beach, Calif.

Hydraulic Press Mfg. Co. (R-960, 965)
Mount Gilead, Ohio

Hydropress, Inc. (R-941, 966)
570 Lexington Ave.
New York 22, N. Y.

Johnson Machine and Press Corp.
Elkhart, Ind. (R-972)

Kelley Co., J. W. (R-950)
3401 West 140th St.
Cleveland, Ohio

Kenmore Metals Corp. (R-938)
80 Broad St.
New York City

La Bahn Machine & Mfg. Co. (R-982)
Lincoln Highway
Menlo Park, N. J.

Lyon-Raymond Corp. (R-984)
3511 Madison St.
Greene, N. Y.

O'Neil-Irwin Mfg. Co. (R-962)
Lake City, Minn.

Parker Mfg. Co. (R-975)
2200 Colorado Ave.
Santa Monica, Calif.

Pines Engineering Co., Inc.
Aurora, Ill. (R-958, 959)

Potter Instrument Co. (R-945)
136 Roosevelt Ave.
Flushing, L. I., N. Y.

Quaker Rubber Corp. (R-953)
Comly and Milnor Sts.
Philadelphia 24, Pa.

Reeves Pulley Co. (R-985)
Columbus, Ind.

Rodgers Hydraulic, Inc. (R-988)
St. Louis Park
Minneapolis 16, Minn.

Saunders & Co., Alexander (R-989)
95 Bedford St.
New York 14, N. Y.

Schrader's Son, A. (R-957)
Division of Scovill Mfg. Co., Inc.
Brooklyn, N. Y.

Sheffield Corp. (R-944)
Dayton 1, Ohio

Solar Aircraft Co. (R-963)
2200 Pacific Highway
San Diego, Calif.

Standard Machinery Co. (R-947)
Providence, R. I.

Steel Equipment Co. (R-956)
2890 East 83rd St.
Cleveland 4, Ohio

Stokes Machine Co., F. J. (R-986)
Philadelphia 20, Pa.

Superior Tube Co. (R-937)
Norristown, Pa.

Titan Metal Mfg. Co. (R-939)
Bellefonte, Pa.

United Engineering and Foundry Co.
2511 First National Bank Bldg.
Pittsburgh, Pa. (R-934)

Voss Machinery Co. (R-942)
2882 West Liberty Ave.
Pittsburgh 16, Pa.

Warren City Mfg. Co. (R-961)
Warren, Ohio

Washington Steel Corp. (R-936)
Washington, Pa.

Westinghouse Electric Corp. (R-935)
306 Fourth Ave., Box 1017
Pittsburgh 30, Pa.

(London), v. 71, Sept. 25, 1947, p. 339-343.

Methods used by Standard Motor Co., Ltd.

22-603. Spot Welding Principles and Practice. I. S. Morton. *Machinery Lloyd (Overseas Edition)*, v. 19, Sept. 27, 1947, p. 68-75.

Fundamentals, materials suitable for spot welding, and modern spot welding equipment.

22-604. Flash Welding Theory and Practice. W. H. Cochran. *Iron Age*, v. 160, Oct. 16, 1947, p. 150-154.

The principle on which this method of welding operates and the technique of its application to materials of various kinds and thicknesses.

22-605. Assembling Turntables With Battery Powered Welders. *Iron Age*, v. 160, Oct. 23, 1947, p. 42.

Assembly of phonograph turntables by Precision Mfg. Co., Bergholz, Ohio.

22-606. Arc Weld Fabrication of Ball Mills. J. F. Cunningham, Jr. *Iron Age*, v. 160, Oct. 23, 1947, p. 43.

Ability to combine wear resistant steel with mild steel, economy in weight and cost, prompted selection of this welding process. Procedures followed.

For additional annotations indexed in other sections, see:
15-40; **18**-219; **24**-301-303-304-305-312-330-339; **27**-223.

597 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

23 INDUSTRIAL USES and Applications

23-365. Nickel in Marine Engineering. A. E. Hanson. *Metal Industry*, v. 71, Aug. 29, 1947, p. 167-170; Sept. 5, 1947, p. 207-208.

Miscellaneous applications.

23-366. The Aerosudest SE-2010 in Production. *Aircraft Engineering*, v. 19, Aug. 1947, p. 265-271, 276.

Procedures and equipment used in construction of French plane.

23-367. Television Comes of Age. *American Machinist*, v. 91, Sept. 25, 1947, p. 99-101.

Adaptation of assembly-line production by RCA to manufacture of television-receiving sets.

23-368. New Westinghouse "Life-Line" Motors Draw Upon Press Industry in Meeting Production Requirements. Floyd McKnight. *Modern Industrial Press*, v. 9, Sept. 1947, p. 40, 42, 46, 48, 60.

Procedures and equipment; presses and related machinery.

23-369. Efficient Production of Metal Window Frames and Related Hardware. Walter Rudolph. *Modern Industrial Press*, v. 9, Sept. 1947, p. 26, 30, 32, 34, 36.

Procedures and equipment used by Johnson Metal Products Co., Erie, Pa.

23-370. The Gas Turbine Power Plant, Part VI. John I. Yellott. *Power Plant Engineering*, v. 51, Sept. 1947, p. 113-114, 116, 118, 120, 122, 124.

Gas turbine materials including properties of many important high-temperature alloys. The coal-fired gas turbine—construction, operation, and details of the present experimental units. 10 ref.

23-371. Thermic Ray Comes to Cooking. *Western Machinery and Steel World*, v. 38, Sept. 1947, p. 100-102.

Equipment and procedures used in manufacture of stainless steel pots and pans by Norris Stamping and Mfg. Co., Los Angeles.

23-372. Making Electrical Controls. *Western Machinery and Steel World*, v. 38, Sept. 1947, p. 103-105.

Procedures and equipment used by Square D Co. in Los Angeles.

23-373. What to Look for in Precision Ground Toolsteel. H. J. Chamberland. *Western Machinery and Steel World*, v. 38, Sept. 1947, p. 106-107, 137.

Manufacture, selection, and applications.

23-374. Sleeping Beauty of Industry. Edwin Laird Cady. *Scientific American*, v. 177, Oct. 1947, p. 154-156.

Miscellaneous industrial applications of silver.

23-375. Cast Bolts for Pipe Joints. C. K. Donoho. *American Foundryman*, v. 12, Sept. 1947, p. 24-27, 62.

Mass production of bolts by the use of metal molds and short-cycle annealing. Experimental results show satisfactory mechanical and corrosion resistant properties. An austenitic malleable bolt with unusual strength, ductility, and corrosion resistance has also been developed for special service. (Presented at Semi-Annual A.S.M.E. meeting, Chicago, June 16-19, 1947.)

23-376. The Green Light Is On in the Manufacture of Home Appliances at Pressed Steel Car Co., Inc. *Better Enameling*, v. 18, Sept. 1947, p. 8-14.

Procedures and equipment used in manufacture of pressed steel products, with emphasis on their pickling and finishing.

23-377. The Manufacture of Hollow Drill Steel in Australia. E. B. Sutters. *B.H.P. Review*, v. 24, June 1947, p. 14-16.

Steels used and production methods required in the making of hollow mining drills, together with the history of this project's development in Australia.

23-378. Assault Bridge in Magnesium. S. K. Ghaswala. *Light Metals*, v. 10, Sept. 1947, p. 434-436.

Development, construction, and assembly of an emergency bridge using ultralight alloys throughout.

23-379. In the Service of Science. (Continued.) *Light Metals*, v. 10, Sept. 1947, p. 443-448.

Physical properties of aluminum in relationship to its laboratory uses. (To be continued.)

23-380. Light Alloys in the Internal-Combustion Engine. (Continued.) *Light Metals*, v. 10, Sept. 1947, p. 450-455; Oct. 1947, p. 542-548.

The theory and practice of the use of aluminum and magnesium for connecting rods, bearings, and pistons. Clearances; piston alloys; piston design. (To be continued.)

23-381. Aluminum and Magnesium at the Engineering and Marine Exhibition. *Light Metals*, v. 10, Sept. 1947, p. 456-492.

A large number of applications shown at British Engineering and Marine Exhibition.

23-382. Selecting, Testing and Fabricating Spring Materials. F. P. Zimmerli. *Materials & Methods*, v. 26, Sept. 1947, p. 74-79.

Adapted from paper presented at Summer Meeting, Society of Automotive Engineers, June 1-6, 1947.

23-383. The Making of a Roll. *Blast Furnace and Steel Plant*, v. 35, Sept. 1947, p. 1096-1097.

A picture story of the manufacture of rolling-mill rolls.

23-384. Tri-Metal Offset Plate Promises Longer Runs. *American Paper Converter*, v. 21, Sept. 1947, p. 17.

Plate recently announced by International Printing Ink Research Lab., New York. It is composed of three layers of metal—chromium, copper and a base metal. The latter was originally steel but is now made of zinc. (See also annotation 23-385 for other source.)

23-385. Tri-Metal Offset Plate. *American Pressman*, Sept. 1947, p. 34.

(See annotation 23-384.)

23-386. Shielding Industrial Electronic Generators. R. A. Whiteman. *Radio-Electronic Engineering* (bound with *Radio News*, v. 38), v. 9, Sept. 1947, p. 8-10, 25.

Methods for avoiding excessive interference to radio facilities from industrial radio-frequency generators. The three materials used are copper, aluminum, and iron. Depth of penetration vs. frequency is charted for these metals.

23-387. Sheet Metal Buildings on Farms. Walter Alwyn-Schmidt. *Sheet Metal Worker*, v. 38, Sept. 1947, p. 64-66.

23-388. Making a Tubular Steel Chair. *Sheet Metal Worker*, v. 38, Sept. 1947, p. 67, 123.

Procedures.

23-389. The Production of Fuel Injection Equipment. *Machinery (London)*, v. 71, Sept. 11, 1947, p. 283-290.

Methods used by British concern.

23-390. Sewing Machine Manufacture. T. R. Gupta. *Machinery (London)*, v. 71, Sept. 11, 1947, p. 296-298.

Methods and equipment used by Jay Engineering Works, Calcutta.

23-391. Aluminum Moves in on New Products. *Modern Industry*, v. 14, Sept. 15, 1947, p. 133.

"Honeycomb" sandwich cores have miscellaneous applications.

23-392. Springs Carry the Load. *Modern Machine Shop*, v. 20, Oct. 1947, p. 198-199.

Production of springs for railroad rolling stock by Crucible Steel Company of America.

23-393. Tools for Oil. C. H. Elliott. *Modern Machine Shop*, v. 20, Oct. 1947, p. 124-130, 132, 134, 136, 138, 140.

Some of the operations used in the making of oil-well drills at Reed Roller Bit Co., Houston, Tex.

23-394. A Radically Different Method of Building Motor Coaches. Leland A. Bryant. *Automotive Industries*, v. 97, Oct. 1, 1947, p. 24-28.

Consolidated-Vultee's use of master tooling dock and geometric mastering system for mass production of heretofore custom-built product at Nashville plant.

23-395. Independent Units Protect Automatic Transfer Lines. Joseph Geschelin. *Automotive Industries*, v. 97, Oct. 1, 1947, p. 30-34, 64.

Buick's cylinder-head setup; transmission-case line at Borg-Warner's Detroit gear division featuring oil-gear valve guide press, Allis-Chalmers induction heating machine, Michigan Tool shear-speed gear shaper, and Baush five-station machine.

23-396. Pontiac's Expanded Facilities. Joseph Geschelin. *Automotive Industries*, v. 97, Oct. 1, 1947, p. 42-44, 76.

Major improvements include one of the largest fully automatic chromium-plating plants, new and enlarged cupolas to increase foundry pouring capacity 50% and a huge parts warehouse.

23-397. Cold Wave on Wheels. *Steel Horizons*, v. 9, no. 4, 1947, p. 12-13.

Stainless-steel refrigerator car.

23-398. A Review of the "Alcrete" House. *Light Metal Age*, v. 6, Sept. 1947, p. 12-13.

Aluminum and concrete are used in the construction of one and two-room houses in Great Britain.

23-399. Aluminum Building Wire. E. W. Renfree. *Modern Metals*, v. 3, Sept. 1947, p. 14-15.

(Turn to page 56)

Rolling and Forming of Metal

(Continued from page 7)

dies. After the dies have been in operation, they can be readily repaired by welding, resurfacing, or metalizing. While the initial cost of Kirksite is high, about 95% is recoverable for melting. By exercising proper precautions, such as excluding lead and iron contamination, the discarded dies may be melted over and over again.

The successful performance of Kirksite dies has been well established in the aircraft industry where they are widely used in drop hammer work and for forming and drawing. They have been used for making Inconel and stainless steel panels as well as aluminum. Stainless steel—one of the most difficult materials to work—was processed in gages ranging from 16 to 24. One automobile manufacturer reports that as many as 18,000 sill cover panels, drawn from 20-gage steel, were made with one set of Kirksite dies. More recent experiments have shown that 585 truck frame crossmembers could be drawn from ⅜-in. steel without excessive wear on the die. To form several thousand such parts a die could be made with steel inserts at the points of maximum wear.

A recent announcement describes the use of a low melting temperature alloy made of bismuth, tin, and lead for temporary dies; it is refrigerated in liquid nitrogen (—320° F.) to attain the required hardness and strength. From six to ten steel parts can be formed before it is necessary to recool the dies.

Forming Light Alloys

The use of the new, higher strength aluminum alloy 75S by the aircraft industry has necessitated changes in methods of fabrication. These changes are based on the results of carefully conducted investigations to determine the best conditions for forming operations in order that the quality of the alloy should not be impaired. Although highly resistant to forming at room temperature, and also notch sensitive, 75S can be worked satisfactorily at elevated temperatures, provided conditions are carefully controlled.

One manufacturer reports (19-186, July 1947) that all dimpling and combined dimpling and riveting operations are performed on the 75S alloy when in the "T" condition (quenched and aged) and while the area immediately surrounding each dimple is at approximately 325° F. The temperature must be closely controlled, since heating above 400° F. for more than about 5 sec. may reduce permanently the strength of the sheet. A comparison of the relative merits of electrical heating by resistance, induction, and thermal conduction led to the adoption of conduction heating because it seemed to be the most reliable from the standpoint of equipment and safest from a metallurgical standpoint.

For combined punching, dimpling, and riveting operations, however, resistance heating was added only as a "booster" to the conductive heating. In this arrangement, the top and bottom dies are attached to blocks which act as heat capacitors, being heated electrically and automatically held at the desired temperature. A time delay system, which comes into action only after the sheet is in contact with the tools, insures a sheet temperature of 300 to 325° F. prior to the start of the punching and dimpling operations. As an aid to conduction heating, an electric current is passed through the dies and the sheet. The arcing at the contacts which usually occurs during resistance heating is eliminated by allowing the current to flow only while pressure is applied.

Confronted with the problem of bending a heavy extruded section (7 sq.in. cross-sectional area) of 75S-T alloy to form spar caps for an experimental plane, a study was made of the working characteristics of large sections at elevated temperatures and the effect upon mechanical properties (19-230, Aug. 1947). At temperatures between 275 and 300° F., the 75S-T formed better than either 24S-T or 14S-T when heated to 400° F. Heating of the 75S-T extruded section to this range was accompanied with little change in physical properties, the tensile strength increasing slightly, depending upon the time held at temperature.

The building of all-magnesium aircraft has also necessitated new fabricating techniques (19-233, Aug. 1947). While the Heliarc process was developed several years ago for the welding of magnesium, fully automatic Heliarc machines are now being used for welding long continuous seams, butt joints being welded at a rate of 36 in. per min. These high speeds are the result of the development of water-cooled heads for the torch.

For dimpling magnesium sheet, electrically heated dies have been conventionally used. The most recent development, however, is direct resistance heating, the dimpling dies forming the contacts and heating the area to be formed. At the start of the compression stroke, following the heating cycle, the current is interrupted and the dimpling operation is performed. For the forming of curved magnesium parts in a stretch press, it was found that preheating the blanks to 430° F. followed by forming over a heated die simplified the operation considerably and also reduced the scope loss to a marked extent.

Properties and installation methods for aluminum electrical conductors for interior wiring of buildings.

23-400. Army Ordnance Turns to Magnesium. C. H. Corey. *Modern Metals*, v. 3, Sept. 1947, p. 16-18.

Some applications of magnesium for military equipment.

23-401. New Projector and Protectochrome Mounts. *Modern Metals*, v. 3, Sept. 1947, p. 20-21.

Photographic slide projector utilizes aluminum castings so effectively that several parts are combined in a single casting.

23-402. Esecution d'Un Creuset en Fonte Speciale Pour Métaux Precieux. (Manufacture of a Special Cast Iron Crucible for Precious Metals.) Pierre Simon. *Fonderie*, July 1947, p. 731-734.

A crucible capable of withstanding external heat of 600° and internal heat of 300° for a mixture of platinum, gold, or silver with concentrated sulphuric acid was desired. Size, shape, composition of the cast iron, and special precautions in manufacture of the crucible.

23-403. Petroleum Steel Needs up Sharply. Warren L. Baker. *World Oil*, v. 127, Oct. 1947, p. 60-62.

A statistical presentation.

23-404. Plain Facts. *Die Castings*, v. 5, Oct. 1947, p. 24, 35.

How concentricity of planer and sander heads is held to a close tolerance by die casting in aluminum with the shank as an insert. An auxiliary drill-press table is also die cast in aluminum, gaining flatness and rigidity.

23-405. New Die Steel for the Die Casting Industry. W. George Johnson. *Die Castings*, v. 5, Oct. 1947, p. 26, 28, 30.

Properties and applications of "PH No. 2"—a product of Crucible Steel Co. of America. (Composition not given.)

23-406. A Picture of Health. *Die Castings*, v. 5, Oct. 1947, p. 32-33.

How a Si-Al alloy is used to die cast three components of X-ray camera made by Fairchild Camera and Instrument Corp.

23-407. Design of a Scientific Instrument. *Die Castings*, v. 5, Oct. 1947, p. 36-41.

Zinc and aluminum die-cast design of hemoglobinometer used by physicians for blood analysis.

23-408. New Field for Stampings Opened by Pressed Metal Pipe Fittings. *Production Engineering & Management*, v. 20, Oct. 1947, p. 92-93.

Production and advantages of various shapes such as 45 and 90° ells, tees, and unions.

23-409. Car Builders Turn to High Tensile Steel. Alvin Gaertner. *Production Engineering & Management*, v. 20, Oct. 1947, p. 94, 102.

New trend at Fisher Body Corp., Hudson Motor Car Co., and Kaiser-Frazer is result of alloy steel shortages when car production was resumed.

23-410. Stainless Steel Piping; Why and Where to Use It. J. D. Mattimore. *Heating, Piping & Air Conditioning*, v. 19, Oct. 1947, p. 81-83.

Reasons for the use of stainless steel in different applications and the standardization of Types 304, 347, and 316 which are said to meet the needs of 95% of industry.

23-411. Diesel-Electric Railroad Motive Power. L. E. Simon. *Metal Progress*, v. 52, Oct. 1947, p. 625-628.

Procedures and equipment for fabrication at Electro-Motive Div., General Motors Corp., La Grange, Ill.

23-412. Metallurgical Progress in the Valve, Fitting and Piping Industry. J. J. Kanter. *Metal Progress*, v. 52, Oct. 1947, p. 629-631.

Important advances in Crane Co.'s foundries during the past 30 years.

23-413. Expansion Fitting With Liquid Nitrogen. Charles H. Wick. *Machinery*, v. 54, Oct. 1947, p. 156-158.

Thermal expansion and contraction of different metals at different temperatures, and amount of nitrogen required per pound of different metals.

23-414. A New Method of Making Electric Connectors. H. T. Thompson. *Tool Engineer*, v. 19, Oct. 1947, p. 50.

How progressive die reduces waste, and improves product and production.

23-415. Production Time Cut by Arc Welding Thin Tubing. *American Machinist*, v. 91, Oct. 9, 1947, p. 94-95.

Procedures and equipment for this process at Consolidated-Vultee Aircraft Corp.

23-416. Press-Fit Tolerances Maintained in Following Production Line Techniques to Turn Out Millions of Oil Seals. *Steel*, v. 121, Oct. 13, 1947, p. 86-87, 116, 118, 121.

As accomplished by National Motor Bearing Corp.

23-417. Muffler Maker Cuts Material and Manufacturing Costs by Installing Equipment to Handle Coiled Strip. *Steel*, v. 121, Oct. 13, 1947, p. 88-89, 114.

Procedures and equipment used by Mackenzie Muffler Co., Inc., Youngstown, Ohio.

23-418. Gegoten Hardmetall als Slijtvast Materiaal. (Cast Hard Metal as Wear Resistant Material.) E. L. Baay. *Metalen*, v. 2, Sept. 1947, p. 1-6.

Uses of cast carbides. Although usually too brittle for cutting tools, it is applicable for use as inserts, liners, nozzles, in locations of excessive wear under small loads. Cast carbides are also used for hard surfacing.

23-419. New Uses for Lithium. H. Seymour. *Industrial Chemist*, v. 23, Sept. 1947, p. 590-592.

Recent applications of the metal and its compounds.

23-420. Vanadium Catalyst; Developments of Imperial Smelting Corporation. W. J. Carter. *Alloy Metals Review*, v. 5, Sept. 1947, p. 2-5.

Development of its use in sulphuric acid manufacture; types and characteristics of catalysts; methods of manufacture and testing; effects of impurities.

23-421. Bimetallic Plates. J. S. Mertle. *National Lithographer*, v. 54, Sept. 1947, p. 28-29, 90.

Efforts made to produce better litho plates, using precious metals such as silver and gold. (To be continued.)

23-422. Pressure Die Casting. *Machinery Lloyd (Overseas Edition)*, v. 19, Sept. 27, 1947, p. 93-95.

Advantages of the above process with examples of items produced by a British firm.

For additional annotations indexed in other sections, see: 3-313-316; 14-301; 27-227.

24-299. Developments in the Design of Turning and Facing Tools. *Machinery Lloyd (Overseas Edition)*, v. 19, Aug. 30, 1947, p. 79-80.

24-300. Designing of "Trouble-Free" Dies. Part LXXIII. Die for Cutting Interior Scallops. C. W. Hinman. *Modern Industrial Press*, v. 9, Sept. 1947, p. 22.

Design details.

24-301. Design for Flash Welding. Harry W. Brown. *Aero Digest*, v. 55, Sept. 1947, p. 82, 85-86, 89, 94.

The basic detail design considerations involved in the design of a typical flash welded assembly. The data are primarily applicable to tubular aircraft parts.

24-302. Die-Grams. Karl L. Bues. *Western Machinery and Steel World*, v. 38, Sept. 1947, p. 135-137.

Design of a punch-and-die assembly. (To be continued.)

24-303. Determination of Internal Stresses in Welded Joints by Means of X-Ray Investigation. S. T. Nazarov and Ia. E. Sanchuk. *Avtogennoe Delo (Welding)*, no. 5, 1947, p. 15-17. (In Russian.)

Application of X-rays with formulas for stress calculation.

24-304. Distribution of Stress in the Longitudinal Seam of a Spot Welded Joint. D. I. Navrotskii. *Avtogennoe Delo (Welding)*, no. 5, 1947, p. 18-19. (In Russian.)

Mathematical analysis of the stress distribution in the longitudinal seam of a spot welded joint. Formulas obtained permit determination of the resulting deformations.

24-305. Influence of Structural Elements on the Quality of Welded Products. N. A. Sholotov. *Avtogennoe Delo (Welding)*, June 1947, p. 31-33. (In Russian.)

The principles of design of welded articles.

24-306. Rigid Frames—Reactions. C. Boldry. *Welder*, v. 16, April-June 1947, p. 46-47.

An extension of the graphical static method used for pin-jointed braced frames where the reactions have to be found before the stress diagrams can be completed and the loads in all the members obtained.

24-307. Simple Method for the Detection of Residual Strains in Hardened Steel. D. M. Nakhimov. *Factory Laboratory (U.S.S.R.)*, v. 13, July 1947, p. 825-832. (In Russian.)

Effects of simultaneous exposure to mineral acids in gaseous and liquid form and application of tensile strain determined using split rings and wedges. The times required for crack formation and for complete failure are affected by the applied tension more than by the acid strength. 11 ref.

24-308. Photo-Elastic Stress Analysis. Roscoe Meadows and B. R. Lee. *Shipyard Bulletin*, v. 12, July-Aug. 1947, p. 14-18.

Application in the laboratory of Newport News Shipbuilding and Dry Dock Co., Newport News, Va. Bakelite models are used.

24-309. Pattern of Square to Oblong Tee Intersecting Oblong Duct. O. W. Kothe. *Sheet Metal Worker*, v. 38, Sept. 1947, p. 62-63.

Sheet-metal layout.

24-310. Research on Rail Sections. Walter Leaf. *Western Metals*, v. 5, Sept. 1947, p. 20-24.

Experiments in railroad metallurgy indicate need for new designs according to this report to A.S.M.E. fall meeting.

24-311. Casting Design; Effect of Simplification Upon Serviceability. W. T. Bean. *Metal Industry*, v. 71, Sept. 19, 1947, p. 239-243.

Essentially the same as "Sound Engine Design Thwarts Parts Fatigue", *SAE Journal*, v. 55, Sept. 1947, p. 44-45. (Item 24-288.)

24-312. Conversion to Welded Construction. Omer Blodgett. *Welding Engineer*, v. 32, Oct. 1947, p. 33-41.

Factors which must be considered, and recommended design for welded structures.

24-313. Air and Hydraulic Cylinder Parts Constructed of Solid Steel Blocks. *Steel*, v. 121, Oct. 6, 1947, p. 129, 162, 165.

Simple design permits square-block construction instead of the usual circular design of cylinder head and cap, providing efficiencies of more than 98%. Other advantages.

(Turn to page 58)

NATIONAL MEETINGS

for December

Dec. 1-5—American Society of Mechanical Engineers. 68th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City. (Ernest Hartford, executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18.)

Dec. 1-6—21st Exposition of Chemical Industries. Grand Central Palace, New York. (Charles F. Roth, manager, International Exposition Co., Grand Central Palace, New York 17.)

Dec. 4-6—Society for Experimental Stress Analysis. Annual Meeting, Hotel Pennsylvania, New York. (W. M. Murray, Secretary, S.E.S.A., P. O. Box 168, Cambridge 39, Mass.)

Dec. 4-6—American Institute of Mining and Metallurgical Engineers. Fifth Annual Conference on Electric Furnace Steel, Hotel William Penn, Pittsburgh. (Electric Furnace Steel Committee, A.I.M.E., 29 West 39th St., New York 18.)

Dec. 10—American Iron and Steel Institute. Regional Technical Meeting, Copley Plaza Hotel, Boston. (A.I.S.I., 350 Fifth Ave., New York 1.)

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Dec. 10	Akron Elks Club	H. B. Knowlton	The Properties and Performance of Steel
Baltimore	Dec. 15	Engineers Club	R. M. Brick	Metals at Very Low Temperatures
Boston	Dec. 5	Sheraton Hotel	Francis G. Tatnall	Fatigue Testing, Up-to-Date and Simplified
Buffalo	Dec. 11	Hotel Statler	J. R. Vilella	Metallography of Iron and Steel
Calumet	Dec. 9	Phil Smidt & Sons, Hammond, Ind.	H. B. Osborn, Jr.	Induction Heating
Cedar Rapids	Dec. 9	Hotel Roosevelt	E. Dale Trout	Uses of X-Ray in Industry
Chicago	Dec. 8	Furniture Mart Club Rooms	Francis B. Foley	President's Night
Cincinnati	Dec. 11	Engineering Society	Francis B. Foley	National Officers' Night
Cleveland	Dec. 1	Cleveland Club	J. B. Austin	Transformation of Austenite
Columbus	Dec. 9	Fort Hayes Hotel	A. J. Pepin	Large Light Metal Forgings
Dayton	Dec. 10		M. G. Fontana	Corrosion
Detroit				Christmas Party
Ft. Wayne	Dec. 8	Chamber of Commerce	R. B. Saltonstall	Electroplating in Industry
Georgia	Dec. 8	Atlantic Steel Co., Atlanta	K. R. Van Horn	Aluminum and Its Alloys
Hartford	Dec. 8	Wright's Tavern		Christmas Party
Indianapolis	Dec. 15	Marott Hotel	A. E. Focke	Mechanical Testing
Lehigh Valley	Dec. 5	Hotel Traylor, Allentown, Pa.	E. E. Thum	Metallurgy as a Philosopher Might Look at It
Los Alamos	Dec. 10			Christmas Party
Los Alamos	Dec. 16		Bruce W. Gonser	Unusual Metals and Their Importance
Milwaukee	Dec. 16	City Club of Milwaukee	Frank K. Savage	Electroplating
Montreal	Dec. 1	Queen's Hotel	M. A. Buell	Applications of Brass
Muncie	Dec. 16	Muncie Central High School	T. R. Lichtenwalter	Corrosion Resistant & Stainless Steels
New Haven	Dec. 19	Lawn Club		Christmas Party
New Jersey	Dec. 15	Essex House, Newark		11th Annual Christmas Smoker
Northwest	Dec. 8	Covered Wagon		Christmas Party
Notre Dame	Dec. 10	Engineering Auditorium, University of Notre Dame	Cyril Stanley Smith	Metallurgy—Ancient Art and Modern Science
Oak Ridge	Dec. 10	S & W Cafeteria, Knoxville, Tenn.	Kent Van Horn	Aluminum and Its Alloys
Ontario	Dec. 5	Royal Connaught Hotel, Hamilton	N. E. Rothenthaler	Sheet Metal Drawing and Stamping
Peoria	Dec. 8	Morton Civic Bldg.	Francis B. Foley	Heavy Forgings
Philadelphia	Dec. 13			Christmas Party
Pittsburgh	Dec. 12	Hotel Schenley		Christmas Party
Pueblo Group	Dec. 18	Minnequa University Club	B. W. Gonser	Unusual Metals and Their Growing Importance
Rocky Mountain	Dec. 19	Oxford Hotel, Denver	B. W. Gonser	Unusual Metals and Their Growing Importance
Rochester	Dec. 8		R. F. Miller	New Developments in Steel
Rome	Dec. 8		Vincent T. Malcolm	Modern Methods of Tests and Inspection
St. Louis	Dec. 19	York Hotel		Christmas Party
Syracuse	Dec. 2	Onondaga Hotel	Charles Lipson	Stress Analysis
Terre Haute	Dec. 8	Indiana State Teachers College Student Union	A. S. Kugler	Inert Gas Arc Welding
Toledo	Dec. 20			Christmas Party
Washington	Dec. 8	Dodge Hotel, Garden House	A. H. Aborn	Recent Developments in the Metallurgy of Ferrous Welding
Western Mich.	Dec. 15	Rowe Hotel		Christmas Party
Worcester	Dec. 10	Sanford Riley Hall, Worc. Polytechnic Inst.	Peter Payson	Principles of Heat Treatment
York	Dec. 10	West York Inn	Walter A. Schlegel	Selection of Alloy Steels for Constructional Purposes

24-314. Mobile Strain Gage Recording. *Engineer*, v. 184, Sept. 12, 1947, p. 244-245.

Equipment used by Vauxhall Motors for indicating and recording strain-gage indications as well as noise level, vibration, acceleration velocity, and displacement at various points on a moving road vehicle.

24-315. The Testing of Structural Connections. Arnold W. Hendry. *Engineering*, v. 164, Sept. 12, 1947, p. 261-263.

Details of tests on portal-frame knee joints, used in bridge construction. Several different welded joints were tested using strain gages and also by the photo-elastic method, using plastic models. The design shown to be superior was checked by destructive testing of 20 frames made under normal shop conditions. (Condensed from paper read before Section G of British Association, Dundee, Aug. 29, 1947.)

24-316. Shear Stresses in Springs. L. E. Adams. *Engineering*, v. 164, Sept. 19, 1947, p. 280.

A mathematical development. Table of values for convenient use.

24-317. Large Strains and Displacements in Stress-Strain Problems. K. H. Swainger. *Nature*, v. 160, Sept. 20, 1947, p. 399-400.

Mathematical development of a theory gives the relationship between stresses and values of displacement and strains in a loaded structure.

24-318. Plastic Deformation and Failure of Polycrystalline Metals Subjected to Strain. V. S. Averkiev, G. N. Kolesnikov, V. A. Pavlov, and M. V. Yakutovitch. *Engineers' Digest (American Edition)*, v. 4, Sept. 1947, p. 416.

Design of a machine for the strain testing of small test pieces in the shape of wires over a temperature range from 195 to 850° C. This machine makes it possible to determine the relationship between stress and strain—tensile stress and elongation at constant temperature and constant speed of straining. It is equipped for automatic registration of the stress-strain diagram. (Translated and abstracted from *Journal of Technical Physics (U.S.S.R.)*, v. 16, 1946, p. 1349-1356.)

24-319. The Influence of Production on the Design of Components in Light Engineering. W. Bauersachs and P. Gabler. *Engineers' Digest (American Edition)*, v. 4, Sept. 1947, p. 417-420.

The use of cost analyses in order to choose the most economical design and process, subject to the specifications of the component to be produced. Application to the processes of impact extrusion, die casting, welding instead of soldering, using interference fits, and brazing. (Translated and condensed from *Die Technik*, v. 1, Aug. 1946, p. 81-85.)

24-320. The All-Metal Wheelair Plane. K. S. Coward. *Modern Metals*, v. 3, Sept. 1947, p. 28-32.

Design of new plane known as the "Wheelair 111A", which differs radically in many respects from others on the market.

24-321. The Get-Together of Tool, Jig, and Fixture Design. J. T. Lancaster. *Tool Engineer*, v. 19, Oct. 1947, p. 37-42.

The economics of tooling, stressing importance of versatility for small lot production. A large number of examples.

24-322. Practical Applications of Involute Splines. *Tool Engineer*, v. 19, Oct. 1947, p. 47-48.

Discussed in general terms and in connection with tractor parts, giving a list of parts for which use of involute splines is now under consideration.

24-323. Progressive Design. *Die Castings*, v. 5, Oct. 1947, p. 21-22, 45.

Successive development of aircraft starter base from forged steel, to brazed assembly of steel stampings, to magnesium die castings. Comparison of machining schedules and other factors show advantages made possible by the change.

24-324. Scanning the Field for Ideas. *Machine Design*, v. 19, Oct. 1947, p. 79-81.

Torsion bars replace conventional springs on each pair of intake and exhaust valves in the engine; identification of molecules with microwave spectroscope; upright drawing boards to provide more space for draftsmen; stronger crankshafts and cost savings by molding method utilizing the cooling capacity of the continuous conveyer hangers on which the crankshafts are poured; and hopper feed which utilizes vibration for aligning blanks and introducing them into a centerless thread grinder.

24-325. Stress Distribution in Punch Presses Analyzed With Electric Strain Gages. *Machinery*, v. 54, Oct. 1947, p. 167-168.

Operation as applied to 30-ton press by Diamond Machine Tool Co., Los Angeles, and resulting design changes.

24-326. Ingenious Mechanisms. *Machinery*, v. 54, Oct. 1947, p. 183-186.

Oscillating motion transmitted from vertical to horizontal plane, by L. Kasper. Mechanism for controlling cutter-head slide of cam-generating device, by Charles and David Golosman.

24-327. A Tooling Program for Forged Globe Valves. Part X. (Concluded.) Carl F. Benner. *Tool & Die Journal*, v. 13, Oct. 1947, p. 74-78.

Tool-design calculations for globe valves.

24-328. Design Improvements Achieved at no Added Cost. Ralph C. Osborn. *Electrical Manufacturing*, v. 40, Oct. 1947, p. 150-153, 240, 242, 244.

How complete redesign of vacuum-cleaner system, involving use of aluminum, plastics, and sheet steel, has resulted in a product that is lighter in weight, higher in efficiency and has improved appearance.

24-329. Master Cams Control Cutters. *Product Engineering*, v. 18, Oct. 1947, p. 98-99.

Milling machine mills all six pins and cheeks in a crankshaft in 48 min. working time. Constructional details.

24-330. Design Possibilities in the Silver Brazing of Cast Iron. Harold Frick. *Product Engineering*, v. 18, Oct. 1947, p. 128-132.

Surface-preparation procedures, recommended design principles, and costs for several examples.

24-331. Composite Dimensioning Speeds Production and Inspection. J. T. Bennett. *Product Engineering*, v. 18, Oct. 1947, p. 141-143.

Results in satisfactory interchangeable manufactured parts and facilitates inspection. Methods for defining dimensional limits of round holes, round corners, and angular tolerances.

24-332. Fatigue Strength of Steel Parts. Philip O. Johnson and Charles Lipson. *Product Engineering*, v. 18, Oct. 1947, p. 144-146.

Charts for the effect of stress concentration on fatigue strength.

24-333. Drawing Three-Dimensional Assemblies. W. E. Walters. *Machine Design*, v. 19, Oct. 1947, p. 82-87.

How three-dimensional drafting technique can be used in the production of three-dimensional assemblies and exploded views of machine units.

24-334. Overload Devices for Machine Protection. A. F. Gagne, Jr. *Machine Design*, v. 19, Oct. 1947, p. 95-100, 134.

The need for means of automatically interrupting drive of a machine in case of abnormal operating conditions. Incorporating interrupting feature in machine and various types of devices.

24-335. Pneumatic Control Speeds Hydraulic Press Response. P. T. Delmer. *Machine Design*, v. 19, Oct. 1947, p. 107-108.

Construction and operation of the above. Single-stroke, nonrepeat operation; continuous reciprocation by foot pedal; full automatic operation; precision inching control; reverse operation; flywheel.

24-336. Practical Design of Thin-Metal Stampings. Part I. Wallace C. Mills. *American Machinist*, v. 91, Oct. 9, 1947, p. 85-87.

Design engineer can save production men many headaches and tool troubles by use of practical thin-metal designs.

24-337. Industrial Design. Ken Unter. *American Machinist*, v. 91, Oct. 9, 1947, p. 86-87.

Hints on design for safety, cleanliness, and appearance.

24-338. Bending Deformation of a Non-uniformly Heated Bar. M. I. Rozovskii. *Journal of Technical Physics (U.S.S.R.)*, v. 17, June 1947, p. 657-660. (In Russian.)

A mathematical treatment of this deformation in a cylindrical bar of material which does not conform with Hooke's law.

24-339. Concerning a Process for Welded Construction of Blast Furnaces. V. L. Tsegel'skii, E. K. Alekseev and V. I. Mel'nik. *Avtogennoe Delo (Welding)*, July 1947, p. 15-16. (In Russian.)

Design details and procedures.

24-340. A Moment Distribution Method for Rigid Frame Steel Structures Loaded Beyond the Yield. Point. M. R. Horne. *Transactions of the Institute of Welding (B.W.R.A. Supplement)*, v. 10, Aug. 1947, p. 6-15.

A method of computing the stresses due to flexure in a rigid steel frame, after the yield stress has been exceeded in a certain number of its members. Formulas for joint rotations, stiffness factors, carry-over factors, and joint translation factors for a beam of rectangular cross section at any stage of plastic deformation. Numerical evaluations of these formulas.

24-341. Notion d'une Portée Limite des Fils Pesants Flexibles. (Concept of Limits of Distortion for Heavy Flexible Wires.) P. Billaud. *Comptes Rendus*, v. 225, Aug. 25, 1947, p. 373-375.

The bending of heavy wires was studied on a theoretical and mathematical basis. An equation for equilibrium, diagram of the range, and the limits.

24-342. Structural Problems of the Commercial Vehicle. V. W. Pilkington. *Institution of Automobile Engineers Journal*, v. 15 (*Proceedings*, v. 41), Aug-Sept. 1947, p. 335-365.

An extensive discussion illustrated by examples of British manufacture.

24-343. Face Buckling and Core Strength Requirements in Sandwich Construction. Conrad C. Wan. *Journal of the Aeronautical Sciences*, v. 14, Sept. 1947, p. 531-539.

Relations between wrinkling stress of facings of sandwich materials and physical properties of the core. Charts for estimating these stresses.

24-344. Determination of the Stress Concentration Factor of a Stepped Shaft Stressed in Torsion by Means of Precision Strain Gages. A. Weigand. *National Advisory Committee for Aeronautics Technical Memorandum No. 1179*, Sept. 1947, 12 p.

Stress concentration factor is ascertained from the measurements. It is shown that the test values always are slightly lower than the values resulting from an approximate formula by Sonntag. (Tanslated from *Luftfahrt-Forschung*, v. 20, July 20, 1943, p. 217-219.)

(Turn to page 60)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad will be printed. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated.

POSITIONS OPEN

Midwest

METALLURGISTS FOR RESEARCH: A variety of attractive vacancies, current and anticipated, for met. interested in research. Welding met., phys. met., mineral dressing, metallography and petrography are a few of the fields offering unusual opportunities. Prompt acknowledgment and confidential treatment of all inquiries. Please address replies directly to Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

SALESMAN ALLOY AND STAINLESS STEEL: Old established steel concern in Chicago area has opening for grad. met. with mill or industrial plant exp. or equivalent. Excellent opportunity for young man now working in plant but interested in sales. Previous sales exp. not necessary. State age, education, exp., salary expected. Box 11-5.

RESEARCH METALLURGIST: To apply the concepts of modern mechanical met. to improving the strength and wear resistance of our products and of the equipment used in their production. Man with M.S. or Ph.D. with major in mechanical met., phys. chem. of solid state, or theoretical mechanics, B.S. in met. or equivalent will be considered only if individual has had strong courses in the subjects listed above or has a record of successful achievements in this field. Starting salary $4000 to $6000. A unique opportunity in a well established firm with a record of continuous research independent of business cycles. Box 11-10.

INSPECTOR OF PRESSURE VESSEL EQUIPMENT: Exp. in insp. of pressure vessels and piping. Must know shop and field fabrication practice. Man under 40 preferred. May be required to travel 60% of time. Give full details of age, education, exp., and salary required. Replies held in confidence. Box 11-15.

DRAFTSMEN: 14 needed. From beginners for detail drawing, through layout draftsmen, where good drawing ability and careful following of instructions are required, to design draftsmen with ability to take over ideas, carry out design, make layouts, show originality and to follow specifications and detailed instructions. Box 11-145.

ENGINEERS: Junior and senior. Recent grad. for junior position and experienced men for senior. Senior engineers needed for fuel metering units and landing gear engineering. Exp. in design, operation, and calculations necessary. Junior engineer to undergo training. Box 11-150.

TECHNICIANS: For tests and minor development work in lab. Technical training or long lab. exp. Work in fuel metering group and automotive installations group. Box 11-155.

SALES ENGINEER: Large aluminum mfr. Technical advisor in sale of aluminum extruded products. Require man thoroughly trained in nonferrous met. and extrusion of metals. Give age education, exp. and salary required. Box 11-160

Southwest

INSTRUCTOR: Unusual opportunity for metallurgist with met. eng. education and preferably some exp. in industry. Exp. in welded fabrication helpful as he will have close contact with large welding mfg. co. in the South. Good pay. Position open first of year. Box 11-20.

West Coast

PRESSED METAL ENGINEER: Man with 10 to 15 yr. design or practical shop exp. with pressed metal work to analyze parts now arranged for steel castings or welded structures and redesign for pressed metal where economical. Should have had exp. with small as well as heavy work; hydraulic presses, crank presses, bending brakes; blanking, forming and drawing, hot as well as cold. Box 11-25.

MACHINE SHOP MANUFACTURING ENGINEER: Man with 10 to 15 yr. exp. in machine shop work and with eng. training to check designs of parts for economical mfg. in machine shop. Examples of work to be checked are: determining if all key-ways are the same size and in line for easy mfg., if center distances will be difficult to hold, if faces to be milled can be adjusted so as to be done in one operation, Exp. with drop forgings would be an advantage in order to determine what parts now made by other processes could more economically be converted to drop forgings. Box 11-30.

STEEL CASTINGS ENGINEER: Man with 10 to 15 yr. exp. in steel fdry. to check eng. designs for good fdry. practice. Some gray iron and malleable iron used, and ability to determine when these could be substituted for steel castings would be desirable. Box 11-35.

TRAILER AXLE ENGINEER: Design eng. with 5 or more yr. design exp. with heavy motor truck or trailer axles to head axle eng. div. of progressive co. Box 11-40.

FUSION WELDING ENGINEER: Leading Southern Calif. mfr. needs good man with college education or equivalent, plus considerable mfg. exp. in fusion welding. Must have exp. in automatic methods and be capable of making new developments and carrying their adoption into the shop. Patents desirable. State salary expected. Box 11-45.

East

MELTING: Recent grad., met., physicist or eng. for research on induction melting and casting of magnetic alloys. Excellent opportunity in a well-equipped progressive lab. Box 11-50.

METALLURGIST: With technical training. Basic knowledge of heat treatment of small tools, casehardening of small parts, and fundamentals of zinc base die casting alloys. Box 11-165.

POSITIONS WANTED

SALES ENGINEER OR METALLURGIST: 7 yr. exp. aircraft quality control and eng. Aluminum, carbon, alloy and stainless steels. Sales exp. Age 34, married, 2 children. Salary $3600. Box 11-55.

RESEARCH DIRECTOR OR PROFESSOR OF METALLURGY: M.S., Ph.D. in met. eng. Registered professional met. eng. Married, 2 children. In charge of modern ferrous research lab., but desires position of greater responsibility, preferably in Pittsburgh area. 10 yr. research exp.; 2 yr. university teaching exp. Has helped to establish several successful labs. Box 11-60.

HEAT TREAT FOREMAN: Age 30, married. 7 yr. exp. as assistant foreman. Practical knowledge of the heat treatment of toolsteels, high speed steels and carburizing; also the operation and maintenance of pyrometers, salt baths and oil and electric furnaces. Would like position with progressive firm. Location immaterial. Box 11-65.

METALLURGICAL ENGINEER: B.A.Sc. met eng., University of Toronto, 1946. Single, age 24. Canadian citizen. Ontario registered professional eng. Employed as asst. met. by Canadian mfr. of automotive transmissions. Exp. in solid, liquid and gas carburizing, quality control, induction heating, isothermal treatments. Desires applied research work in ferrous phys. met. Eastern Canada or U.S. Box 11-70.

METALLURGIST: College grad. Age 52. Exp. in shop production problems, heat treat, testing, inspection, control of materials, material specifications, metallography and welding. Desires responsible position in development or production with responsible co. with future. References upon request. Box 11-75.

ATTENTION: To firms desiring an exp. pressed metal eng. for all types of work and materials. Has held positions of superintendent, chief engineer, chief estimator and supervisor of tools and dies, methods, sales. Work ranged from small to large, easy to difficult, plain to extra deep drawing. Prefers an agreeable climate. Registered eng. of Mass. Box 11-80.

METALLURGIST: B.S. in met., 1941. Age 28, married. Excellent background in phys. met. 3 yr industrial exp., 3 yr. exp. in research and development. Exp. in all phases of production heat treatment, phys. testing, and high temperature testing. Desires position as plant met. or position offering research and development. $4000 min. Box 11-85.

HEAT TREAT SUPERINTENDENT: 4 yr. college work with met. training. 12 yr. diversified exp. in heat treating of tools, dies and production parts. Exp. in all alloys and all modern methods. Progressive and efficient. New York-New Jersey area preferred. Box 11-90.

MATERIALS INSPECTOR: Desires responsible job. 7 yr. phys. testing in steel mill. 7 yr. govt. inspector. Last 6 yr. agency's sole district rep. "Very Good" efficiency rating. Exp. all types rolled, cast, steel and iron products, miscellaneous materials. 1000 hr. night school. Age 34, married, 2 children. West Coast preferred. Box 11-95.

EXECUTIVE ENGINEER: Met. eng. degree. Over 20 yr. exp. in steel mills, foundry, industrial furnace design and operation. Thorough knowledge of modern methods of mfg. and met. processing. Customer contact work and sales. Best ref. Box 11-100.

ASSISTANT TO EXPORT MANAGER: Or European sales representative. Swiss citizen with experience as assistant to purchasing manager of large iron works is seeking a connection with an American iron fdry., steel mill, or rolling mill. Box 11-105.

CHEMIST: B. Ch.E. 7 yr. industrial lab. supervision. Exp. in ferrous, nonferrous, analysis; physical testing metals and rubber; plant process control nonferrous prepaint finishing; painting and all types of metal plating; allied met. exp.; plastics and resins. Age 29, married. Desires responsible position in materials control or applied research. Box 11-110.

MECHANICAL AND METALLURGICAL ENGINEER: A.B., B.S. in mech. eng. and M.E. Married, age 31. 6 yr. exp. in phys. and met. testing of ferrous and nonferrous alloys (including high-temperature alloys), investigations of heat treating problems and service failures and helping vendors with met. problems. Supervising metallurgical control testing. Excellent knowledge of modern heat treating practices and equipment. Box 11-115.

QUALITY CONTROL METALLURGICAL INSPECTOR: Over 20 yr. with one firm. Desires change of position. Broad knowledge of ferrous and alloy heat treatments, hardness testing, interpretations and investigation of field complaints. Age 43, married. Free to travel anywhere. Detailed information on request. Box 11-120.

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RESEARCH-DEVELOPMENT ENGINEER: A.B. in physics. Exp. in arc and resistance welding (ferrous and light alloys), metal forming, physical testing, and manufacturing process development. Some met. exp. 7 yr, with one co. as research engineer, 3 yr. supervisory. Age 30, married. Desires responsible position in industrial lab., near university or technical institute. Box 11-135.

METALLURGIST: 7 yr. as trainee in wire mills covering analytical lab. work, microscopy, specifications, plant research and efficiency, and production control. Grad. of technical college with diploma in met. Australian seeks employment as industrial met. or chem. in U.S. Box 11-140.

METALLURGICAL SALES ENGINEER AND METALLURGICAL CONSULTANT: B.Sc. degree, age 38, married. 13 yr. diversified exp. in ferrous met. in supervisory capacity in heat treating, physical testing and metallography. Consulting, trouble shooting and development. 2 yr. exp. as metallurgical sales engr. directing toolsteel sales. Desires position as heat treat superintendent or metallurgical sales engr. Pa.-Ohio vicinity preferred. Box 11-170.

METALLURGIST-WELDING ENGINEER: B.S. in met. eng. (1941). Age 30, married. Exp. in joining of all types of ferrous and nonferrous alloys especially corrosion resistant and high-alloy materials; high-temperature material study, and metallography of high temperature alloys. Desires development work offering stability of employment. Western New York preferred. Box 11-175.

METALLURGICAL ENGINEER: B.S. Exp. in ferrous met. including control of development and research work, physical and metallographic testing of metals, development of high-temperature alloys and stainless steels, research in heat treatment by controlled atmosphere, alloying and casting, both fdry. and by lost wax process. Desires position with established laboratory or mfg. concern or managership of plant. Box 11-180.

24-345. Compressive Strength of 24S-T Aluminum-Alloy Flat Panels With Longitudinal Formed Hat-Section Stiffeners Having a Ratio of Stiffener Thickness to Skin Thickness Equal to 1.00. William A. Hickman and Norris F. Dow. *National Advisory Committee for Aeronautics Technical Note No. 1439,* Sept. 1947, 20 p.

Results for a part of a test program.

24-346. Automatic Multilift Cam Mechanism. *Machinery (London),* v. 71, Sept. 4, 1947, p. 263.

Mechanism for imparting a variable movement to the slide of a wire-forming machine by a special cam.

24-347. Use of Strain Gages in the Testing of Motor Vehicles. *Machinery (London),* v. 71, Sept. 25, 1947, p. 344-345.

Use by Vauxhall Motors, Ltd.

24-348. Die Castings for the Jack & Heintz Internal Combustion Engine. *Machinery (London),* v. 71, Sept. 25, 1947, p. 353-354.

Proposed design has been abandoned because of technical difficulties encountered in production of large and complex parts.

24-349. Liquid Springing. A. E. Bingham. *Engineering,* v. 164, Sept. 26, 1947, p. 289-291.

Fundamental principles of "liquid springs"—shock-absorbing devices utilizing the compressibility of liquids at high pressures. The construction of high-pressure glands, the properties of different steels under these pressures (up to 50,000 psi.), and the properties of different liquids.

24-350. The Closed Gear Train. H. E. Merritt. *Engineer,* v. 184, Sept. 26, 1947, p. 284-285.

Solutions are worked out for the design of gear trains in which each gear mes' with two other gears.

24-351. Aluminum + Plastics Offers Unusual Design Possibilities. Junius D. Edwards. *Iron Age,* v. 160, Oct. 23, 1947. p. 46-48.

Recent developments in materials and processing techniques. Fabricating methods for combining aluminum and plastics.

For additional annotations indexed in other sections, see:
9-149; 19-343; 22-598.

217 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

25 MISCELLANEOUS

25-147. Automatic Safety Stops Improve Conveyer Efficiency. Jack Boden. *American Machinist,* v. 91, Sept. 25, 1947, p. 104-105.

Safety stops, actuated by end bumpers on roller conveyers and transfer, prevent assembled motor frames from falling off conveyers.

25-148. Trends in Nickel Alloys. *Western Machinery and Steel World,* v. 38, Sept. 1947, p. 134.

Trends in stainless steels, high-temperature alloys, alloy cast irons, cast bronzes, and high-nickel irons.

25-149. Clad Steels. *Materials & Methods,* v. 26, Sept. 1947, p. 97.

Properties of materials used; forming; machining; shearing and punching; flame cutting; welding; heat treating; cleaning; finishing; and applications.

25-150. Incendiary Action of Electric Sparks in Relation to Their Physical Properties. F. J. Llewellyn. *Transactions of the Institution of the Rubber Industry,* v. 23, June 1947, p. 29-34.

Preparation of fundamental data from which the electrostatic hazard associated with a particular process and plant can be estimated consists of 2 separate investigations—determination of electrification of the material during processing and determination of the minimum electrostatic energy necessary to produce ignition. Apparatus and procedures for these determinations. Data for several metallic and plastic powders, and for vapor-air mixtures.

25-151. Handling and Storing of Light Metals. Benjamin Melnitsky. *Light Metal Age,* v. 6, Sept. 1947, p. 10-11, 20.

How the basic attributes of aluminum and magnesium—lightness and resistance to corrosion—should contribute to economical storekeeping and materials-handling methods.

25-152. Maintenance in the Boilerhouse. L. D. Hoadley. *Iron and Steel Engineer,* v. 24, Sept. 1947, p. 51-52.

Some maintenance practices in a steel-mill powerhouse. (Presented at A.I.S.E. Detroit District Section Meeting, Nov. 12, 1946.)

25-153. Speeding Openhearth Charging. R. J. Harry. *Iron and Steel Engineer,* v. 24, Sept. 1947, p. 68-71; discussion, p. 71-72.

This has assumed increased importance because of new developments in openhearth practice. (Presented at A.I.S.E. Pittsburgh District Section Meeting, April 14, 1947.)

25-154. Jacking-up a Blast Furnace Shell. John Neary. *Iron and Steel Engineer,* v. 24, Sept. 1947, p. 79-82.

Procedure for leveling the No. 5 blast furnace at Sparrows Point while renewing a portion of the shell. (Presented at A.I.S.E. Philadelphia District Section Meeting, April 5, 1947.)

25-155. Abstracts of Papers to be Presented at A.I.S.E. Annual Convention, William Penn Hotel, Pittsburgh, Pa., September 22, 23, 24, 25, 1947. *Iron and Steel Engineer,* v. 24, Sept. 1947, p. 86-97.

25-156. Wartime Expansion of Carnegie-Illinois Steel Corp. in the Pittsburgh District. T. J. Ess. *Iron and Steel Engineer,* v. 24, Sept. 1947, p. CI-13—CI-32.

Additional blast furnaces, electric and openhearth furnaces, and rolling mills have added tremendous capacity to the plants.

25-157. Aluminum and Its Alloys. Hugh P. Vowles. *Canadian Metals & Metallurgical Industries,* v. 10, Sept. 1947, p. 26-27.

A brief review.

25-158. Notices of Works Visited During the Centenary Celebrations. *Institution of Mechanical Engineers Proceedings,* v. 156, Sept. 1947, p. 224-241.

Descriptions of 34 British industrial plants.

25-159. Directory of Materials. Fourteenth Edition. *Machine Design,* v. 19, Oct. 1947, p. 179-240, 242, 244, 246.

Three major listings. The first presents materials by trade names in alphabetical order and includes brief data on properties, characteristics, and representative applications. The second is an index by types. The last is an alphabetical listing of producers giving complete addresses along with trade names and types of materials. Includes a single listing—"Stainless Steels"—immediately following the list of materials by trade names which presents brief data on properties, characteristics, uses and forms, and is accompanied by a list of producers, types of stainless produced, and trade names.

25-160. Condensed Review of Some Recently Developed Materials—Arranged Alphabetically by Trade Names. *Machinery,* v. 54, Oct. 1947, p. 169-181.

Table of properties and applications.

25-161. Streamlined Handling of Dies and Stampings. *Tool & Die Journal,* v. 13, Oct. 1947, p. 65-66, 119-121, 133.

Use of hydraulic feed-table conveyers.

25-162. Toolsteel Progress During 30 Years. Arthur T. Clarage. *Metal Progress,* v. 52, Oct. 1947, p. 568-571.

Story of Columbia Tool Steel Co. shows how the industry modernized its equipment and its viewpoint in pace with the requirements of its customers.

25-163. New Ideas in Conveyerized Assembly. Chester S. Ricker. *American Machinist,* v. 91, Oct. 9, 1947, p. 96-100.

Some new automobile-assembly procedures.

25-164. Jones & Laughlin Open New Iron Ore Research Lab. at Negaunee, Mich. *Skillings' Mining Review,* v. 36, Oct. 11, 1947, p. 1-2.

Describes and illustrates facilities.

25-165. The Story of Malleable Platinum. M. Schofield. *Endeavour,* v. 6, July 1947, p. 125-128.

An historical review. 22 ref.

25-166. Minerals for Chemical and Allied Industries. A Review of Sources, Uses and Specifications. Part XIII. Sydney J. Johnstone. *Industrial Chemist,* v. 23, Sept. 1947, p. 619-625.

For manganese and mercury. (To be continued.)

25-167. The Iron and Steel Engineers Group Report of the Fourth Meeting. Discussion on Gas Turbine Applications in Iron and Steel Works. A. T. Bowden, W. H. Gibson, J. W. Railly, and R. G. Voysey. *Journal of the Iron and Steel Institute,* v. 157, Sept. 1947, p. 115-130.

Paper with discussion by R. J. Welsh, T. W. Thursfield, B. Wood, J. Calderwood, F. E. Baumann, and R. P. Towndrow, and authors' replies.

25-168. Cooperative Research Activities. *Metallurgia,* v. 36, Sept. 1947, p. 253-267.

Recent work of the various British metallurgical research associations, such as the British Iron and Steel Research Assoc.; British Non-Ferrous Metals Research Assoc., by W. L. Hall; the British Refractories Research Assoc., by A. E. Dodd; the British Cast Iron Research Assoc., by J. G. Pearce; and the British Welding Research Assoc., by F. A. Fox.

For additional annotations indexed in other sections, see:
14-308.

26 STATISTICS

26-138. Estimates Russian Steel Output at 25.4 Million Tons by 1950. *Iron Age,* v. 160, Sept. 25, 1947, p. 115.

Summary of report by L. M. Herman of U. S. Dept. of Commerce's Office of International Trade.

26-139. Mesaba Taconite Quandary. *Mining World,* v. 9, Sept. 1947, p. 20-23, 25-31.

An extensive discussion of the

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United States iron-ore problem. The various alternatives, including importation of ore. Geology of the various Mesaba ranges.

26-140. How Costly Will Taconite Be? *Mining World*, v. 9, Sept. 1947, p. 32-34.
An economic analysis.

26-141. Secondary Metals: How Statistics Can Control Quality. F. J. Erroll. *Light Metals*, v. 10, Sept. 1947, p. 436-438.
Economic importance of recovered light alloys and the factors governing industry's ability to use of these materials.

26-142. Consumption of Metals in the Mining Industry. Timothy C. May and Harold Montag. *Mechanization*, v. 11, Sept. 1947, p. 97.
Information for the period July 1943-June 1945.

26-143. Western Metals Forum. N. H. Engle, D. A. Rhoades, Tom A. Murphy, Morris B. Pendleton, J. Lester Perry, and E. T. Grether. *Western Metals*, v. 5, Sept. 1947, p. 28-29.
Future of the Western aluminum industry.

26-144. Outlook for Lead Industry. Robert Lindley Ziegfield. *Western Metals*, v. 5, Sept. 1947, p. 58.
Secretary, Lead Industries Assoc., believes there is no reason for worry about exhaustion of supplies.

26-145. Iron, the Key to Austria's Prosperity. *Chemical Age*, v. 57, Sept. 6, 1947, p. 327-329.
Iron and steel facilities. (Condensed from a Report issued by Allied Commission for Austria.)

26-146. Steel Production in China. J. K. Stafford. *Machinery Lloyd (Overseas Edition)*, v. 19, Sept. 13, 1947, p. 81-82.
A brief review.

26-147. Italian Aluminum Production. *Metal Industry*, v. 71, Sept. 19, 1947, p. 245.
Effect of cession of Istria to Jugoslavia is shown to be a severe blow to Italian aluminum production, because of the bauxite deposits in that section.

26-148. Nonferrous Metal Developments on the Pacific Slope. Richard J. Anderson. *Chemical and Engineering News*, v. 25, Sept. 22, 1947, p. 2704-2706.
A survey.

26-149. Steel on the Pacific Coast. L. H. Duschak. *Chemical and Engineering News*, v. 25, Sept. 22, 1947, p. 2707-2709.
A survey.

26-150. Alloy Steel Production Holds at 9% of Total Output. Tom Campbell. *Iron Age*, v. 160, Oct. 2, 1947, p. 119-120.
Statistics for 1939-1947.

26-151. Wanted—Six Million Tons of Steel. D. I. Brown. *Iron Age*, v. 160, Oct. 9, 1947, p. 113-117.
Results of *Iron Age* survey indicate that more than 27,000 miles of pipelines are to be built in next few years. Estimated requirements.

26-152. Trends in Die Casting. Fred C. Ziesenheim. *Light Metal Age*, v. 6, Sept. 1947, p. 14-15, 20.
A statistical review.

26-153. Russian Mills Seek Improved Techniques. *Engineering and Mining Journal*, v. 148, Oct. 1947, p. 86.
New developments in light metals, nickel-cobalt, tin, and tungsten-molybdenum, as reported by McGraw-Hill world news correspondent in Moscow.

26-154. New Mexico Gold, Silver, Copper, Lead, and Zinc. S. A. Gustavson. *Bureau of Mines 1946 Minerals Yearbook Preprint*, 1947, 14 p.
Statistical data.

26-155. Central States Silver, Copper, Lead, and Zinc. A. J. Martin. *Bureau of Mines 1946 Minerals Yearbook Preprint*, 1947, 20 p.
Statistical data.

26-156. Mercury. Helena M. Meyer and Alethea W. Mitchell. *Bureau of Mines 1946 Minerals Yearbook Preprint*, 1947. 16 p.
Foreign and domestic statistics.

26-157. Manganese. Norwood B. Melcher. *Bureau of Mines 1946 Minerals Yearbook Preprint*, 1947, 16 p.
Foreign and domestic statistics.

26-158. Bismuth. Richard H. Mote. *Bureau of Mines 1946 Minerals Yearbook Preprint*, 1947, 4 p.
Foreign and domestic statistics.

26-159. Platinum and Allied Metals. Hubert W. Davis and Gertrude N. Greenspoon. *Bureau of Mines 1946 Minerals Yearbook Preprint*, 1947, 11 p.
Foreign and domestic statistics.

26-160. Minor Nonmetals. G. Richards Gwinn. *Bureau of Mines 1946 Minerals Yearbook Preprint*, 1947, 14 p.
Foreign and domestic statistics.

26-161. Chromium. Edwin K. Jenckes. *Bureau of Mines 1946 Minerals Yearbook Preprint*, 1947, 10 p.
Foreign and domestic statistics.

26-162. Tin—Production, Consumption and Price Trend. Part I. *Metals*, v. 18, Sept. 1947, p. 13-16.
Statistical report prepared by Industry Division, U. S. Department of Commerce. (To be continued.)

For additional annotations indexed in other sections, see: 27-235.

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27 NEW BOOKS

27-218. Electric Furnace Design; Manufacture and Application in Germany. W. J. Millar and Others. 109 p. Mapleton House, 5415 17th Ave., Brooklyn 4, N. Y. (Reproduced from PB 32566, Office of Technical Services, Dept. of Commerce, Washington.) $3.00.
Summary of results obtained by investigating team is followed by details of the individual plant visits.

27-219. Symposium on Atmospheric Weathering of Corrosion Resistant Steels. 92 p. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. $1.50.
An up-to-date picture of the behavior of the stainless steels when exposed to atmosphere. A collection of seven technical papers delivered during the symposium sponsored by A.S.T.M. Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel, and Related Alloys, and held at the 1946 A.S.T.M. meeting.

27-220. Metals and Plastics; Production and Processing. Thomas P. Hughes. 384 p. Irwin-Farnham Publishing Co., 332 S. Michigan Ave., Chicago 4, Ill. $4.50.
Processes in manufacturing industrial parts and a study of some of the more common metals, alloys, and plastics. For engineers.

27-221. Machine Shop Operation. Volume 1—Lathe Operations. Volume 2—Milling Machine Operations. Volume 3—Shaper Operations. Lewis E. King. The Macmillan Co., 60-62 Fifth Ave., New York City, N. Y. $1.00 each.
The first book deals with the general-purpose back-geared screw-cutting lathe, the fundamental principles involved in its operation, and the cutting tools generally used. The second book treats similarly of horizontal and vertical milling machines, and the uses of their various attachments. The third book takes up the shaping of horizontal, vertical and irregular surfaces, angular surfaces, dovetails, slots and keyways.

27-222. Contributions to the Metallurgy of Steel. No. 11. Hardenability of Alloy Steels. Revised Edition. 146 p. American Iron and Steel Institute, 350 Fifth Ave., New York, N. Y.
Tentative hardenability bands applicable when H steel chemistry is specified; selection of automotive steel on the basis of hardenability; standard end-quench hardenability test procedure; hardness conversion numbers.

27-223. The Welding Encyclopedia. 12th Edition. L. B. Mackenzie, compiler and editor. 1024 p. The Welding Engineer Publishing Co., 330 W. 42nd St., New York, N. Y.

27-224. Allcast Aluminum Alloy SC8. Revised Edition. 8 p. National Smelting Co., 6700 Grant Ave., Cleveland 5, Ohio. Gratis.
Properties and applications of alloy containing 3.5% Cu and 6% Si.

27-225. Control Charts—an Introduction to Statistical Quality Control. Edward S. Smith. 160 p. McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. $3.00.
This book, by the professor of mathematics at University of Cincinnati's Engineering College, enhances his reputation as a teacher and author of understandable textbooks in mathematics. During the last war, Professor Smith devoted much time to the organization and teaching of standard intensive courses on quality control in various ordnance plants under the auspices of the War Production Board. This book profits from that contact with a large number of men with only the sketchiest of mathematical backgrounds, and is therefore recommended to any production executive who desires to improve quality of his plant's product at lower cost by means of statistical quality control.

27-226. Atlas Metallographicus. Band III. Aluminium. Erster Teil: Binare Legierungen des Aluminiums. (Atlas of Metallography. V. 3. Aluminum. Part I: Binary Alloys of Aluminum.) Heinrich Hanemann and Angelica Schrader. 126 p., 1941. Gebruder Borntraeger, Berlin-Zehlendorf, Germany. (A photostatic reproduction.)
The latest information available to the authors is concisely compiled. Numerous photomicrographs and tables. 45 ref.

27-227. Aircraft Materials and Processes. 3rd Edition. George F. Titterton. 537 p., 1947. Pitman Publishing Corp., 2 W. 45th St., New York, N. Y. $4.75.
Physical terms, heat treatment terms, and physical test terms defined. Testing of aircraft materials; properties and uses of aircraft steels; heat treatment and surface hardening of steel, shaping of metal; corrosion-resisting steels; nickel, copper, and wrought aluminum alloys; aluminum-alloy castings; magnesium alloys; metal joining processes; corrosion and its prevention; wood and glue; fabrics, plastics, and rubber; and the selection of materials. Extensive reference data.

27-228. Grundlagen Der Eisengewinnung. (Principles of Iron Production.) Robert Durrer. 210 p., 1947. Verlag Francke A. G., Bern, Switzerland.
An elementary text for beginning students in metallurgy. Theory, equipment, and procedures.

27-229. Flotation Fundamentals. 2nd Edition. 54 p. Dow Chemical Co., 310 Sansome St., San Francisco, Calif.
The history of the development of flotation, and the chemicals that cause the process to function effectively. The xanthates and the flotation of sulphide minerals. Intended primarily for students and nontechnical plant personnel.

27-230. United States Patents on Powder Metallurgy. Raymond E. Jager and Rolla E. Pollard. 139 p., 1947. U. S. Government Printing Office, Washington 25, D. C. $0.30.

Patents issued from 1836 up to Jan. 1, 1947, are listed under a number of groups and subgroups. In each case they are arranged according to number, together with a brief description of scope.

27-231. 1947 Guidebook and Directory for the Metal Finishing Industries. 436 p. Metal Industry Publishing Co., Inc., 11 West 42nd St., New York 18, N. Y.

Combines 16th edition of "Plating and Finishing Guidebook" and 6th edition of "Metal Finishing Buyers Directory". Abrasive methods; cleaning and pickling; electroplating solutions; surface treatments; control and testing; chemical tables; organic finishes; and organic methods.

27-232. O.S.R.D. Reports. 105 p. June 1947. Office of Technical Services, Dept. of Commerce, Washington 25, D. C. (P.B. 78000).

A bibliography and index of the numbered publications available from the Office of Technical Services. Arranged by O.S.R.D. number with corresponding P.B. numbers; a cross reference list according to P.B. number with corresponding O.S.R.D. numbers; an author index; and a subject index.

27-233. Metal Industry Handbook & Directory. 36th Edition. 468 p., 1947. Louis Cassier Co. Ltd., Dorset House, Stamford St., London, S.E.1, England.

General properties; general data and tables; electroplating, finishing, galvanizing, and anodizing; and directory. The coverage appears to be British only.

27-234. The British Nonferrous Metals Directory. 224 p. Metal Bulletin, London, England. 5s.

An up-to-date and comprehensive guide to British suppliers of raw and semifinished nonferrous metals. A classified section lists a wide range of nonferrous products, together with their suppliers.

27-235. Nonferrous Production Metallurgy. 2nd Edition. John L. Bray. 587 p., 1947. John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. $5.00.

A textbook of production metallurgy. Several of the author's ideas as to methods of presentation are followed with resulting benefit to the student. For instance drawings are simplified so that the usual multiplicity of details will not confuse the novice. Three introductory chapters are followed by separate chapters on each of the important metals. Chapters on secondary metals; marketing of bullion, ore, and concentrates; and use of physical chemistry in metallurgical processes. New illustrative problems, developments during World War II, and discussions of the strategic position of the U. S. with regard to each of the metals.

27-236. The Mechanical Working of Steel. Edwin Gregory and Eric N. Simons. 198 p. Sir Isaac Pitman & Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2, England. 10s, 6d.

Developments that have taken place in the technique of the hot and cold working of metals, and the structures produced by the various types of operations and how these can be modified to produce the best results. The importance of choosing the right type of material. The problems that arise in the cold working and pressing of metals in relationship to the changes that occur due to overstraining and during heat treatment.

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